Research article

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http://www.imedpub.com/

Pediatrics & Health Research
ISSN 2574-2817

2018
Vol.3 No.2:8

DOI: 10.21767/2574-2817.100033

Gaps in Knowledge Levels of Health Workers on Recommended Child Feeding Practices and Growth Monitoring and Promotion Actions

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Received date: July 11, 2018; **Accepted date:** August 24, 2018; **Published date:** August 31, 2018

Citation: Nsiah-Asamoah C (2018) Gaps in Knowledge Levels of Health Workers on recommended Child Feeding Practices and Growth Monitoring and Promotion Actions. Ped Health Res Vol.3:No.2:8.

Abstract

Background: Mothers rely greatly on the advice given by Health Workers (HWs) on appropriate Infants and Young Children Feeding (IYCF) practices. Therefore, the knowledge levels of HWs play an important role in the effective promotion of recommended IYCF practices. However, evidence in literature highlights that HWs do not have adequate knowledge on recommended child feeding practices

Objective: This study aims at assessing the nutritional knowledge levels of HWs who work in child health facilities in two predominately rural districts in Ghana.

Methods: The study is a descriptive cross-sectional. Responses from 192 HWs working at Child Welfare Clinic (CWC) departments of 21 health facilities to a self-administered questionnaire is used for analysis. In all, respondents responded to 31 questions which assess their knowledge levels on recommended daily feeding practices for various age groups of young children and the recommended age of introducing water and other foods. Some of the questions also evaluate their ability to interpret growth curves of children and carry out the required action(s) thereafter. Their knowledge levels are also assessed with respect to body-building, body-protective, energy-giving, calcium, iron and vitamin A rich food sources.

Results: Some of the HWs (14.1%) did not know the appropriate age for introducing dairy foods to infants and few (7.8%) wrongly indicated that water should be introduced before 6 months of age. Only a small percentage of the HWs (6.8%) knew that non-breastfeeding children aged between 6 and 23 months should be fed 4 or more times daily. More than 80% of the HWs were unable to identify all the actions that should be targeted at each of the 5 growth patterns of children. Only 22.9%, 25.0% and 10.9% were able to mention at least three iron, vitamin A and calcium rich food sources respectively. About 83.9% and 90.6% of the HWs did not know absorption enhancers and inhibitors of iron-rich foods. Overall, a higher proportion (52.4%) of the surveyed HWs had an average score ranging between 50% and 69% whereas, only 6.5% had a good score of > 70%.

Conclusion: The surveyed HWs demonstrated low knowledge on recommended child feeding practices, actions that should be targeted at the various growth patterns of children and the majority of the HWs did not know food sources of iron, vitamin A and calcium. This low level of knowledge jeopardizes the provision of high quality nutritional support by caregivers. It is recommended that the nutritional knowledge of HWs working in CWCs should be enhanced and updated accordingly, either by the regular participation in refresher or continuing education programmes that also focus on complementary feeding of children. The findings also suggest that HWs require more education on recommended growth promotion actions.

Keywords: Nutritional knowledge, Health workers, Child health facilities, Rural, Ghana

Introduction

The first 1000 days of life, from conception to 2 years of age, is a critical period which requires nutrition-specific interventions that are usually recommended during postnatal visits at health facilities or Child Welfare Clinics (CWCs) [1-4]. In most developing countries, some of the nutritional interventions provided in CWCs include vitamin A supplementation, child weighing and charting of the weight-for-age Z-scores, identification of growth faltering [5] and counselling of caregivers on age-appropriate Infant and Young Child Feeding (IYCF) practices [6]. In order to promote appropriate IYCF practices, a number of strategies have been implemented in child health facilities, most particularly through the use of nutrition education and Behaviour Change Communication (BCC) approaches, which are mainly provided by health workers [7]. Generally, HWs have historically played a vital role in improving child and maternal health, and later life adult health [8-11]. For example, Hjort et al.'s [11] study highlights the indispensable role of nurses particularly during the first year of a child's life which entails documenting and reporting on how they promote proper infant nutrition (especially breastfeeding) and hygiene. Their crucial role also involves monitoring the health and development of children, and referring ill infants to general practitioners. Evidence in the literature also shows that HWs are the main source of nutrition and health information for caregivers in most settings [12-14].

Therefore, it is during health worker-caregiver contacts that HWs take the opportunity to provide counselling on recommended child nutrition and health practices [12-15]. Samuel et al. [13] indicate that HWs are highly regarded by women who access antenatal and postnatal services and they rely on them for IYCF counselling. Globally, nurses are the largest group of health care professionals who provide nutritional advice particularly to new mothers [16]. Evidence in the literature has established that nutritional messages HWs share with caregivers during counselling or consultation sessions are effective in improving upon feeding practices and the nutritional status of infants [15-19]. In other words, malnutrition in children can be reduced if knowledgeable health workers provide accurate, practical, consistent, timely and updated dietary advice that is tailored toward the specific nutritional needs of children [20,21].

Several reports, however, highlight that HWs lack adequate knowledge on recommended child feeding practices [22-24]. Questions as to the capability of these HWs to offer nutritional advice to enable mothers adhere to recommended guidelines on appropriate IYCF practices troubles any concerned individual who encounters these reports. In addition, although most of the counselling in sub-Saharan Africa on IYCF practices is primarily conducted by nurses or health volunteers, little is done to enable them develop their capacity in nutrition at the professional, organizational, or systemic levels [18]. Further, it is observed that IYCF information and counselling provided by HWs are often inadequate and needs to be strengthened [23]. Similarly, there have been reports that because key IYCF practices are not well understood by HWs, the effectiveness of their knowledge-sharing activities are considerably affected [25] and even in some cases, they are likely to avoid the task of providing infant feeding counselling services to caregivers [26]. There have been situations where IYCF practices information given by HWs have been generally described to be inconsistent [27]. In Ghana, it has been highlighted that the nutritional knowledge of professional health workers on complementary feeding practices is limited and they also have poor nutritional counselling skills [5,22,24,27].

For instance, Gyampoh et al.'s [22] study on health facilities in Ghana reported that over half of the surveyed HWs had poor knowledge scores of recommended child feeding practices and in the interpretation of child growth charts. In addition, most HWs could not adequately indicate the recommended actions for particular growth patterns on the growth chart of children. These findings show that HWs knowledge, awareness, skills, practices, attitudes and motivation play an important role in their abilities to deliver effective counselling services in relation to the provision of optimal IYCF to caregivers [6,25-29].

The novelty of this present study is that all the previous studies [5,22,28] conducted in Ghana to assess the knowledge levels of HWs on recommended IYCF practices and GMP actions were conducted in urban areas, specifically Accra, the capital city of Ghana. For instance, Agbozo's [5] study was carried out at four CWCs in the Greater-Accra Region of Ghana. Similarly, Gyampoh et al.'s [22] was also undertaken in six public health facilities, in the Greater-Accra Region of Ghana. Laar et al.'s [28] study although in the Upper Manya Krobo District of the Eastern Region mainly concentrated on observing GMP activities of HWs, particularly the taking of length/height measurements of children and did not assess the nutritional knowledge of HWs. Therefore, to the best knowledge of the author, this is the first study to access the nutritional knowledge of HWs on appropriate IYCF practices in addition to their interpretation of children's growth chart and offering required action(s) on the basis of GMP services rendered. Besides, none of the modified questions from previous studies included items assessing HWs knowledge on specific examples of iron, calcium and vitamin A-rich food sources, inhibitors and enhancers of iron absorption and as such were novel questions. Questions on iron inhibitors and enhancers were included mainly because of reports from the latest Ghana demographic health survey that the majority (66%) of children aged 6-59 months are anaemic particularly in rural settings in Ghana [30].

Therefore, this study was conducted to assess the nutritional knowledge levels of health workers at 21 child welfare clinics in two predominately rural districts in Ghana. The study assessed their knowledge on the recommended age for introducing water and other foods to children, daily feeding frequency for the various age groups of young children depending on whether they were breastfeeding or not. The study also sort to investigate the capability of health workers to interpret children's growth charts and carry out required action(s) thereafter. Their knowledge levels were also assessed with respect to body-building, body-protective, energy-giving, calcium, iron and vitamin A rich food sources.

Materials and Methods

This was a descriptive cross-sectional study conducted to assess the nutritional knowledge of health workers (HWs) working in Child Welfare Clinics (CWCs) on recommendations for appropriate IYCF practices. The study was undertaken in two predominately rural districts (Afram Plains South and Afram Plains North districts) in the Eastern Region of Ghana. The two districts were purposively selected out of 26 districts in the Eastern Region on the basis of being ranked as the first and second districts with the highest prevalence of underweight in children below five years within the Region in both 2013 and 2014. In 2013, the prevalence of underweight ranged between 0.02% and 20.85%. Kwahu Afram Plains North and Kwahu Afram Plains South were ranked as the first and second districts with an underweight prevalence of 20.85% and 18.21% respectively among children under five years. Similarly, in 2014, within a range of 0.4% and 22.0%, Kwahu Afram Plains North and Kwahu Afram Plains South had an underweight prevalence of 22.0% and 16.3% respectively.

The study population included all professional health workers (HWs). Enrolled nurses, midwives, community health nurses and community health workers who provide growth monitoring and promotion (GMP) services and offer nutritional counselling services to caregivers at CWCs were among the health workers considered for the study. Out of a total of 230 questionnaires that were administered to HWs in 21 health facilities where GMP and nutritional counseling services were offered to

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caregivers and their children, 192 - representing a response rate of 83.5% were returned

The items on the questionnaire were modified versions of questions that were employed in similar studies [22-25,30] to assess health workers' knowledge regarding recommendations on appropriate IYCF practices and GMP activities. In addition, some of the items on the questionnaire assessed HWs knowledge on energy-giving, body-building, body-protective, vitamin A, iron and calcium rich foods that are locally available in the districts. Expert advice and suggestions to improve the construct and content validity of the items on the questionnaire was obtained from a registered dietician and a district nutrition officer who had a background knowledge in Public Health Nutrition.

The questionnaire was then pilot-tested among 12 health workers and a reliability coefficient value of 0.78 was obtained for the items after running analysis using Cronbach's alpha coefficient of reliability. Information sought from the HWs included demographic data, educational background, knowledge on the appropriate age of introducing water and other foods to infants and recommended daily feeding frequencies for the different age groups of young children depending on whether they were breastfeeding or not. Some of the questions also evaluated the ability of HWs to interpret growth patterns on charts and undertake the required actions thereafter.

With the assistance of the Nutrition Officers in the two districts, some local foods described as body-building (protein food sources), body-protective (usually fruits and vegetables) and energy-giving foods (mainly carbohydrate and fats/oils food) were identified. Again, the researcher with the help of the two field assistants visited the market on four market days to take a record of local foods that are grown and readily available in the two districts. An inventory of these local foods in the district was taken to be used in analysing and evaluating the responses of the HWs.

The data was collected between 13th November and 4th December 2017, participation was voluntary and all the HWs who agreed to participate in the study signed an informed consent form. Confidentiality was maintained and anonymity of responses was ensured. All consenting HWs were given a cover letter and written information regarding the aim of the study, voluntary participation, and confidentiality of data. In addition, no HW was required to write his or her name on the questionnaire yet researchers assigned identity numbers to each questionnaire, not to identify any HW with a questionnaire but rather to enable the data to be managed and entered in an organized manner.

All the HWs were informed that the study was not being conducted to grade their practices but to obtain information about their knowledge levels on child nutrition and GMP activities and actions. Additionally, the HWs were told to answer questions that they could and leave out questions that they had no idea about or indicate that by ticking the option "I do not know" as this was included in some options. The HWs who agreed to participate in the study were given the questionnaire in the morning at the start of work around 8:00 am and were informed that the completed questionnaire will be collected at the end of working hours around 1:00 pm. The HWs were informed that they were not allowed to take the questionnaires home to be returned later and therefore were asked to complete the questionnaire at work independently. The HWs who agreed to participate in the study were discouraged from accessing literature/information when completing the questionnaire. Ethical approval and clearance for the study was granted by the Dodowa Health Research Centre (DHRC) Institutional Review Board (IRB) of the Ghana Health Service (Reference/Identification: DHRCIRB/04/02/17)and the IRB of University of Cape Coast (U.C.C) (Reference/Identification: UCCIRB/CHLS/2017/02).

Statistical Analysis

The data were analysed using the Statistical Package for the Social Sciences (SPSS) programme (version 21.0). The questions on the questionnaire were 31 in number and they were scored differently. For 13 of the questions, each correct answer was assigned a score of 1 mark. For 12 questions, a score ranging between 0 and 3 was assigned to each depending on the number of correct answers that were provided for each question. For 5 of the questions, a score ranging between 0 and 2 was assigned to each depending on the number of correct answers that were provided for each question. There was one (1) question which assessed health workers' knowledge on the importance of weighing children monthly and 6 correct options were provided. All the six (6) answer options that were provided were correct and health workers were required to tick any number of options which in their opinion were reasons for weighing children monthly. Therefore, for this question, a maximum score of 6 marks was assigned to participants who were able to indicate that all the options were reasons for weighing children monthly.

Final total scores ranging between 0 and 65 marks were assigned to each participant depending on their individual performance. In addition, the nutritional knowledge level scores of the respondents were converted into percentages and were graded with the following interpretations: A (80-100%), B+ (75%-79%), B(70%-74%), C+(65%-69%), C(60%-64%), D +(55%-59%), D(50%-54%) and E(49% and below) which is comparable to how grades are generally assigned to scores of students in tertiary institutions in Ghana. The scores were further categorized as follows: 70%-100% (good), 50%-69% (average), and 49% and below average (poor) similar to a related study in India [31]. Descriptive statistics were used to summarize the data collected; and the results were displayed in frequencies, percentages and means. Analyses that were conducted included the Spearman correlation which was used to assess whether any significant difference existed between HWs with respect to their rank/position, experience -in number of working years- and their nutritional knowledge score. A statistical significance level (r-value) of < 0.05 was used in this study.

Results

The background information of the nursing students who participated in the study is presented in **Table 1.** A total number of 192 health workers working at Child Welfare Clinics (CWCs) of 21 health facilities were sampled for the study.

As indicated in **Table 1**, a higher proportion (33.9%) of the HWs were community health nurses. The average age of the HWs was approximately 29.2 years. Most (60%) of the participants had between 1 and 4 years of working experience after their professional training (**See Table 1**).

Table 1: Background characteristics of Health Workers who participated in the study.

Characteristics	**n (%)**
Average age of respondents (years)	29.2
Sex	
Male	89 (46.4)
Female	103 (53.6)
Position	
Public health nurse	2 (1.0)
Midwife	13 (6.8)
Registered General Nurse and enrolled nurses	22 (11.4)
Community Health Nurse	65 (33.9)
Community Health Worker	58 (30.2)
Community Health Volunteer	19 (9.9)
Student Nurse	4 (2.1)
Field Technician	2 (1.0)
Disease Control Officer	1 (0.5)
Mental Health Nurse	3 (1.5)
Health Assistant	2 (1.0)
Health Nurse / Matron	1 (0.5)
Length of providing GMP services at CWC/RCH	
<1year	71 (37.0)
1-4 years	84 (43.8)
5-8 years	29 (15.1)
9-12 years	7 (3.6)
>12 years	1 (0.5)
1Workshops/Trainings/orientations attended	
No training	19(9.8)
Breastfeeding counseling	105(54.7)
Lactation management	49(25.5)
Complementary Feeding	87(45.3)
2CMAM	79(41.1)
General client counseling	42(21.8)
Others (Vaccine Administration)	1(0.5)

1Multiple responses were given for participation/attendance of workshops/ training and orientations and each frequency value calculated for all the 192 health workers. 2CMAM refers to Community -based Management of Acute Malnutrition.

With regard to attendance of training workshops and orientations, majority (54.7%) of the HWs indicated that they had participated in trainings on breast feeding counselling. However, less than 50% of the HWs had participated in workshops on Complementary Feeding and Community-based Management of Acute Malnutrition (CMAM).

The knowledge levels of HWs on recommended Infant and Young Child Feeding (IYCF) practices is summarized in **Table 2.** Most (59.4%) of the HWs knew that a child can be breastfed for 24 months or beyond after introducing other foods. With regard to the appropriate age of introducing other foods, more than 80% but less than 90% correctly knew that cereals, roots, tubers, vegetables, fruits, eggs, and meat should be introduced either at or after 6 months of age. With respect to water, 86.5% correctly indicated that it should be introduced at or after 6 months of age. However, the findings indicate that about 13.5% of the HWs did not know the right age for introducing water to infants. Worth mentioning is the response of the HWs regarding the recommended age for introducing dairy products. Although a higher proportion (78.1%) knew the recommended age for introducing dairy products, some (14.1%) indicated that they did not know the appropriate age for introducing dairy food products. In addition, approximately7.8% wrongly indicated that dairy products should be introduced before 6 months of age.

Table 2: Health workers' knowledge on infant and young child feeding.

Measured knowledge Item	**n(%)**
Up to what age can a child be breastfed after introducing other foods	
0-5 months	3 (1.6)
6-11 months	27 (14.1)
12-17 months	11 (5.7)
18-23 months	33 (17.2)
≥ 24 months	114 (59.4)
Don't know/not sure	4 (2.1)
Appropriate age of introduction of the following to infant	
Water/other liquids	
<6 months	22 (11.5)
> 6 months	166 (86.5)
Do not know	4 (2.1)
Staple foods (cereals, roots and tubers)	
<6 months	15 (7.8)

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> 6 months	170 (88.5)
Do not know	7 (3.7)
Vegetables (added to food or on their own)	
<6 months	16 (8.3)
> 6 months	168 (87.5)
Do not know	8 (4.2)
Fruits	
<6 months	15 (7.8)
> 6 months	171 (89.1)
Do not know	6 (3.1)
Dairy products (milk, cheese, yoghurt etc)	
<6 months	15 (7.8)
> 6 months	150 (78.1)
Do not know	27 (14.1)
Eggs (yolk and whole egg)	
<6 months	14 (7.3)
> 6 months	165 (85.9)
Do not know	13 (6.8)
Meats (chicken, fish, meat)	
<6 months	15 (7.8)
> 6 months	164 (85.4)
Do not know	13 (6.8)
Recommended daily feeding frequency for age groups	
6-8 months old breastfeeding children	
0-1 meal/day	16 (8.3)
2 and higher	158 (82.3)
Do not know	18 (9.4)
9-23 months old breastfeeding children	
0-2 meals/day	17 (8.8)
3 and higher	156 (81.3)
Do not know	19 (9.9)
6-23 months old non-breastfeeding children	
0-3 meals/day	158 (82.3)
4 and higher	13 (6.8)
Do not know	21 (10.9)
Recommended frequency of feeding milk and milk products to non-breastfeeding 6-23 months old children	
At least once daily	97(50.5)
Twice or more daily	19 (9.9)
Do not know	76 (39.6)

Responses from the HWs regarding the recommended daily feeding frequencies for the various age groups, according to WHO and UNICEF recommendations, are presented in **Table 2.** The majority (82.3%) of the HWs knew the recommended daily feeding frequency for breastfeeding children aged between 6 and 8 months. For breastfeeding children in the age group 9 -23 months, a higher proportion of the HWs (81.3%) also knew the recommended feeding frequency. However, one finding that deserves to be noted is that only 6.8% of the HWs knew that non-breastfeeding children aged between 6 and 23 months should be fed 4 or more times daily. Again, only 9.9% of the HWs knew that non-breastfed children age 6-23 months should receive milk or milk products two or more times a day to ensure that their calcium needs are met.

Responses given by the HWs on their interpretations of different growth patterns of children on the growth chart and the needed action(s) afterwards, is presented in **Table 3.** All (100%) of the HWs were of the view that monthly weighing of children is important. With regard to the importance of weighing children monthly, out of the six correct options given, only about 34.9% were able to indicate that all the options given are importance of weighing children on a monthly basis. The majority (94.3%) of the respondents knew that the purpose of the growth chart is for monitoring, recording the growth or weight of children. The results revealed that less than 10% of the HWs were able to relate the interpretation of the growth patterns to factors such as good or poor growth, healthy or unhealthy eating habits and presence or absence of sickness in the past month prior to weighing. For example, for the pattern of a growth curve falling, only 9.9% were able to relate it to poor growth, eating and sickness. Similarly, only 5.7% of the HWs could relate a flattening growth curve pattern to poor growth, eating and sickness.

With respect to recommended growth promotion actions that should be carried out for each of the growth curve patterns, more than 80% of the HWs were unable to identify all the actions that should be targeted at each of the 5 growth trends presented to them. For example, only 12.5% of the HWs were able to indicate the two actions for a curve on a growth chart that falls once, which are, enquiring about feeding and illness in addition to counselling the caregiver. In addition, only 2.6% and 2.1% were able to identify all the three actions for a curve on a growth chart that falls twice and remains the same for two consecutive months respectively. In both situations which indicate a possibility of malnutrition, the three recommended actions are enquiring about feeding, illness, counselling the caregiver and referring the child to a Medical/Nutrition Centre. In the case of the recommended actions for a curve on the growth chart that was rising, the majority (91.7%) of HWs identified only one action, which is praising the caregiver, but only 6.3% of the HWs were able to indicate that the caregiver should also be counselled in addition to being praised by the HW.

actions.

Table 3: Comprehension of growth charts and knowledge on required actions.

Abbreviated/Summarized item	n(%)
Opinion as to whether monthly weighing of children is important	
Yes	192 (100.0)
Importance of weighing children monthly: can identify…	
No importance	1 (0.5)
One importance	97 (50.5)
Two importance	13 (6.8)
Three importance	11 (5.7)
Four importance	2 (1.0)
Five importance	1 (0.5)
aAll six importance given	67 (34.9)
Purpose of growth chart	
Monitoring/recording growth/weight of children	181 (94.3)
Other	5 (2.6)
Do not know	6 (3.1)
Comprehension of pattern of growth curve and required action	
When curve on the growth chart is falling:	
Ability to recognize growth-falling trend and relate to poor growth/eating/sickness (scores 3/3)	19 (9.9)
When curve on growth chart is flattening	
Ability to recognize flattening growth trend and relate to poor growth/eating/sickness (scores 3/3)	11 (5.7)
When curve on the growth chart is rising	
Able to identify rising growth curve and relates to good growth/health/eating/care (scores 3/3)	14 (7.3)
Comprehension of Recommended actions based on pattern of growth curve	
Curve on growth chart falls once	
None	4 (2.1)
Identifies only one(1) action (scores 1/2)	164 (85.4)
Identifies all two(2) actions (scores 2/2)	24 (12.5)
Curve on growth chart falls twice	
None	8 (4.2)
Identifies only one(1) action (scores 1/3)	166 (86.5)
Identifies only two(2) actions (scores 2/3)	13 (6.8)
Identifies all three(3) actions(scores 3/3)	5 (2.6)
Curve on growth chart is same as the previous month (fails to gain any weight in one month)	
None	7 (3.6)
Identifies only one(1) action (scores 1/2)	166 (86.5)
Identifies all two(2) actions (scores 2/2)	19 (9.5)
Curve on growth chart is same for two consecutive months	
None	24 (12.5)
Identifies only one(1) action (scores 1/3)	148 (77.1)

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Identifies only two(2) actions (scores 2/3)	16 (8.3)
Identifies all three(3) actions (scores 3/3)	4 (2.1)
Curve on the growth chart is rising	
None	4 (2.1)
Identifies only one(1) action (scores 1/2)	176 (91.7)
Identifies all two(2) actions (scores 2/2)	12 (6.3)

The last section on the questionnaire assessed HWs knowledge on body-building, body-protective, energy-giving, iron, calcium and vitamin A rich food sources that are readily available in the districts. In assessing the nutritional knowledge of the HWs, they were required to state at least three food items described as body-building, body-protective and energy-giving. A summary of their responses is presented in **Table 4.** The knowledge levels of the HWs with regard to identifying body-building, protective and energy-giving foods was good, since more than half(>50%) of the HWs were able to mention three or more food items belonging to these three food groups. The responses of the HWs with respect to food items that provide the body with iron, calcium and vitamin A, three micronutrients of public health concern to child nutrition (**Table 4**) showed poor knowledge levels. Only 22.9% and 25.0% were able to mention at least three iron and vitamin A rich foods respectively. In the case of calcium-rich foods, only 10.9% were able to mention at least three food items that provide the body with calcium.

Another surprising observation made was that 83.9% of HWs did not know absorption enhancers of iron-rich foods. Similarly, the majority (90.6%) of the surveyed HWs had no idea about the absorption inhibitors of iron-rich foods.

The final scores of the HWs with regard to their knowledge on growth monitoring and promotion activities, recommended IYCF practices and local food sources of the different nutrients were re-categorized into good (score of between 70% and 100%), average (score of between 50% and 69%) and poor (score of less than 50%). As shown in **Table 5**, a higher proportion of the surveyed HWs had an average score. It is important to note that only 6.5% had a good score and obtained a grade of A, B+ or B. The knowledge levels of approximately 41.1% of the HWs were below average and described as poor since they obtained less than 50% (a grade of E) scores.

Further analysis was run to assess where the rank/position and working years' experience of a HW were significantly related to the comprehension score obtained. Work experience in this study was recorded in terms of completed number of years in the service as a professional health worker. Spearman correlation was ran to assess whether any relationship existed between the total score attained by respondents based on their position/rank and the working years' experience. The results as shown in **Table 6** indicate that the nutritional knowledge score based on the working years of experience of a HW had a weak but direct insignificant relationship with a correlation (r-value) of 0.113. On the other hand, the nutritional knowledge score based on the working position of HW had a weak but an inverse relationship with a r value of 0.239. The results as shown in **Table 6** indicate that the nutritional knowledge score based on the working years' experience of a HW was not statistically significant at a correlation value of 0.01 level. However, the comprehension score based on the position of a HW was statistically significant ($r < 0.01$). The results indicate that among the 13 HWs who had a good score, 4 and 3 were midwives and general nurses respectively.

Table 4: Knowledge levels of health workers on body-building, body-protective, energy -giving and micronutrients food sources in the study area.

Abbreviated/Summarized item	**n(%)**
Familiarity with the 3 food groups	
Good/Familiar (HW mentions all the 3 food groups)	114 (59.4)
Average (HW mentions at least 2 food groups)	54 (28.1)
Poor (HW mentions 1 food group)	13 (6.8)
No Idea	11 (5.7)
Name at least 3 foods in district described as body-building, Can name:	
none	36 (18.8)
only 1 food source	18 (9.4)
2 food sources	28 (14.6)
3 or more food sources	110 (57.2)

Name at least 3 foods in district classified as body -protective, Can name:	
none	37 (19.3)
only 1 food source	10 (5.2)
2 food sources	37 (19.3)
3 or more food sources	108 (56.2)
Name at least 3 foods in district classified as Energy-giving, Can name:	
none	32 (16.7)
only 1 food source	11 (5.7)
2 food sources	29 (15.1)
3 or more food sources	120 (62.5)
Name at least 3 foods in district described as Iron-rich foods, Can name:	
none	53 (27.6)
only1 food source	57 (29.7)
2 food sources	38 (19.8)
3 or more food sources	44 (22.9)
Name at least 2 enhancers of iron-rich foods, Can name:	
none	161 (83.9)
only 1 example	28 (14.6)
2 or more examples	3 (1.6)
Name at least 2 inhibitors of iron-rich foods	
none	174 (90.6)
only 1 example	14 (7.3)
2 or more examples	4 (2.1)
Name at least 3 foods in district described as Vitamin A-rich foods : Can name:	
none	49 (25.5)
only1 food source	67 (34.9)
2 food sources	28 (14.6)
3 or more food sources	48 (25.0)
Name at least 3 foods in district described as Calcium- rich foods : Can name:	
none	54 (28.1)
only1 food source	57 (29.7)
2 food sources	60 (31.3)
3 or more food sources	21 (10.9)

Table 5: Summary of overall comprehension scores of Health Workers.

Variable	n (%)
Overall Comprehension score	
Good	13 (6.8)
Average	100 (52.1)

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Poor	79 (41.1)
Comprehension scores Grades	
80 – 100 A (Excellent)	1 (0.2)
75 – 79 B+ (Very Good)	3 (1.6)
70 – 74 B (Good)	9 (4.7)
65 – 69 C+ (Very Satisfactory)	20 (10.4)
60 – 64 C (Satisfactory)	28 (14.6)
55 – 59 D+ (very fair)	21 (10.9)
50 – 54 D (fair)	31 (16.5)
49 <E (unsatisfactory)	79 (41.1)

Table 6: Correlation between respondents score, their position and number of working years.

Total Score		position of health worker	Years of experience
	Pearson Correlation	-.209**	0.113
	Sig. (2-tailed)	0.004	0.12
	N	192	192

**. Correlation is significant at the < 0.01 level (2-tailed).

Discussion

This study was conducted in order to assess the knowledge levels of health workers made up of nurses, midwives, community health workers, community health volunteers and disease control officers/field technicians on recommended Infant and Young Children Feeding (IYCF) practices. The ability of HWs to interpret growth pattern or curves of children on growth charts and carry out the appropriate actions based on the growth status of children was also assessed. In addition, in order to encourage caregivers to feed children using locally grown or readily available food items, the knowledge levels of the HWs was also evaluated with regard to their ability to identify food sources of the various food groups and micronutrient of public health concern to children.

As part of assessing the background characteristics of the HWs, information was sought on whether they had participated in any nutrition-related workshops and refresher programmes. It was observed that whereas more than 50% had participated in trainings on breastfeeding counselling, less than half had participated in workshops on complementary feeding and Community-based Management of Acute Malnutrition (CMAM). This finding corroborates with a similar study also conducted in Ghana which found about 93% of HWs to have participated in training workshops that were focused on breastfeeding counselling and only 12.6% to have benefited from training programmes on CMAM [22]. This finding suggests that whereas most HWs were likely to be abreast with breast feeding recommendations and how to counsel mothers, other aspects of child nutrition such as complementary feeding and CMAM might not have been given the needed attention by Health agencies in Ghana.

The finding on HWs knowledge on the recommended age for introducing water and dairy products deserves to be mentioned. In the case of dairy products, about 21.9% either did not know the recommended age for introducing them or indicated that it should be introduced before 6 months of age. Similarly, with regard to the recommended age of introducing water, about 13.5% of the HWs did not know the right age for introducing water to infants. These findings have implications on the kind of information that these HWs are likely to convey to caregivers which might include non-recommended ones such as feeding infants below 6 months on infant milk formulas. These findings also suggest that HWs need more training programmes on counselling caregivers on complementary feeding.

Regarding responses on WHO and UNICEF recommendations on daily feeding frequencies for the various age groups of infants, although over 80% provided right answers for breast feeding children in the various age groups, only 6.8% of the HWs rightly indicated that non-breastfeeding children aged between 6 and 23 months should be fed 4 or more times daily. Again, a higher proportion (90.1%) of the HWs did not know WHO's recommendation of giving non-breastfed children age 6-23 months milk or milk products two or more times a day to enable them meet their daily calcium requirements. Similarly, in the study of Gyampoh et al. [22] about 25% of HWs were unable to indicate the recommended daily meal frequency for non-breastfeeding children. It can be inferred from this finding that most HWs may not be in a better position to advise caregivers of children who might have unfortunately lost their mothers or children who have stopped breastfeeding on their own.

Regarding HWs interpretation of children's growth chart and the required action(s) thereafter, for a growth curve that was falling, only 9.9% were able to relate it to poor growth, eating and sickness. Similarly, only 5.7% of the HWs could relate a flattening growth curve to poor growth, eating and sickness. Contrary to the findings in this study, in the study of Gyampoh et al. (2014) [22], more than 90% of the HWs were able to relate the trend of a child's growth curve to poor or good growth, eating, care and presence or absence of sickness in the past one month before a child's weight was taken.

In the case of recommended actions for a growth curve that was rising, whereas most of the HWs identified only one action, which is praising the caregiver, only 6.3% of the HWs were able to indicate that the caregiver should also be counselled in addition. Similarly in Gyampoh et al.'s study, the majority (94.1%) of the HWs indicated that a caregiver should be praised if the curve on her child's growth chart was rising, and were unable to indicate that the HW should also counsel the caregiver [22]. These findings have implications on the activities of these HWs with respect to their ability to carry out the appropriate growth promotion actions particularly for the various cases of poor growth in children at their health facilities.

The responses of the HWs with respect to food items that provide the body with iron, calcium and vitamin A was poor. In a related study, it was revealed that although HWs generally were able to mention some iron-rich foods to the caregivers they were counselling, some gave answers like palm oil and iodated salt [24]. In the present study, more than 80% of the HWs had no idea about absorption enhancers and inhibitors of iron-rich foods. The poor knowledge levels of HWs on absorption enhancers and inhibitors of iron was evident in a previous study conducted by the Global Alliance for Improved Nutrition (GAIN) project in nine districts in the Brong Ahafo Region of Ghana. In this study it was observed at CWCs that although much emphasis was placed on the intake of plant food sources such as dark green, leafy vegetables than animal sources, HWs did not emphasize the need to take in vitamin C- rich foods in addition to these green-leafy vegetables in order to increase the absorption of [24]. Vitamin C or ascorbic acid (found in citrus fruits like oranges, lemon, grape fruit, tangarine and lime) is the most effective absorption enhancer of non-heme iron. Apart from citric or ascorbic acid, other dietary factors that enhance absorption of non-heme iron include organic acids, and carotenes [32]. On the other hand, the uptake of non-heme iron is inhibited by phytic acid in grains and cereals, phytates found in fibrous foods and polyphenols present in some vegetables, coffee, tea, and wine. These inhibitors bind to the non-heme iron in the gut thereby preventing it from being absorbed by the body [33]. It has been proven that a higher proportion of iron particularly in non-heme iron food sources can be absorbed by the simultaneous intake of these enhancers [33]. Young et al. (2018) [34] also emphasized that an adequate knowledge of absorption enhancers and inhibitors of iron in meal planning for vegetarian women and children is important to help prevent or reduce the severity of iron deficiency disorders such as anaemia that confront particularly these groups of people.

These findings also have implication on the ability of HWs to offer counselling services to caregivers to enable them plan nutritious meals that will increase the absorption of iron particularly from plant-based iron food sources in order to reduce the prevalence of anaemia in children. Considering current concerns on combating micronutrient deficiency disorders such as anaemia, poor vision/ night blindness, stunted growth and rickets in children, these findings suggest that HWs perhaps require more in-depth education on the prevention of nutritional deficiency disorders in children using food items available in their communities of operation.

Generally, a higher proportion (52.1%) of the surveyed HWs obtained an average score and only 6.8% obtained a grade of A, B+ or B (described as a good score). In similar studies, the knowledge levels of HWs on key recommended IYCF practices were described as poor [6, 22-27]. An explanation that can be given to this poor performance is that perhaps much attention is not given to nutrition education as part of the curricula used in training HWs as asserted in previous studies [35-39]. Sunguya et al. (2013) [36] specifically highlighted that although health students regarded nutrition care as an integral component of their roles as professional HWs, they felt incapacitated by the non-prioritization of nutrition education, inadequate faculty members to teach nutrition courses, poor application of nutrition science and poor collaboration with nutrition professionals. Again, another explanation that can be attributed to this poor performance may be as a result of most HWs not getting an opportunity to attend nutritionally- related refresher or *in*-service *training* courses regularly as indicated by Banwat et al. (2018) [38] and as can be inferred from **Table 1.** Another reason that can account for the generally poor knowledge levels of the surveyed HWs is the professional background of some of the HWs working at the CWCs and therefore has implications on the recruitment process of HWs in Ghana. Usually, once prospective nurses pass their final licensure examinations and complete a one-year rotation (a form of internship or national service), there are invariably posted to health facilities by the Ministry of Health. Usually in typical rural settings with poor infrastructures, most HWs refuse postings to these areas and therefore the few who accept to work in these areas regardless of their backgrounds are placed in whichever department to render services. As shown in **Table 1**, mental health nurses, disease control officers and community health volunteers work in some CWCs, but there is likelihood that they might not have received adequate training in child health issues. The gaps in the nutritional knowledge levels of HWs may even create a feeling of incompetency in HWs [37] and in situations where counselling is provided it is likely to be poor in content and non-factual [22].

Findings with regard to the relationship between HW nutritional knowledge and their working years' experience have been inconsistent. While some researchers [39-43] reported positive and significant associations, others reported negative [44] and others [45, 46] found no association between health worker nutritional knowledge and the number of working years' experience. Although, the results revealed that an increase in knowledge score was not statistically significant with professional working years' experience, it was found in this study that a higher proportion (10 out of 13) of the HWs who

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had a good score were those who had fewer years of working experience (> 1 - 4 years). A possible explanation of this finding could be that less experienced HWs might have recently completed their training and therefore may be in a better position to remember some information from their nutrition courses. On the other hand, the higher experienced HWs might not have benefited that much in updating their nutritional knowledge by participating in nutrition refresher courses or workshops. Another reason that could be attributed to the poorer scores of HWs who had served for longer periods might be that their zeal to update their knowledge with current information might have declined. Sharma and Jain (2017) [44] indicated that younger HWs who do not have longer working experience are more likely to have the zeal to obtain current information, assimilate and use newly acquired information rather easily and this may improve their nutritional knowledge levels.

In this study, the comprehension score based on the position of a HW was statistically significant ($r < 0.01$). In other related studies the rank or position of the HW were found to be statistically related with the nutritional knowledge score attained [39-43]. The results indicate that among the 13 HWs who had a good score, 4 and 3 were midwives and general nurses respectively. A possible reason for this finding is that midwives are mainly in charge of offering both maternal and child health services. Midwives counsel pregnant women on what they should eat during pregnancy, continue to educate them on foods to eat after birth and foods to be given to children to ensure optimal growth and development after birth. The researcher observed that in these rural districts, a health facility that was fortunate to have a professional midwife employed the services of this HW as of matron in that facility. As "heads" or in-charges of health facilities, it would be expected that they would have adequate nutritional knowledge to impact to the staff working under them or serve as role-models to them. In addition, as heads of health facilities, they are perhaps more likely to represent their facilities in continuing or refresher nutrition education programmes and later relay information learnt to other staff members.

A closer look at the knowledge levels of HWs in the present study shows that generally, they had poorer knowledge levels as compared to HWs in other related studies [47,48] that were undertaken in India, also a developing country like Ghana, perhaps as a result of benefiting from nutritional training programmes in appropriate IYCF practices. For instance, in the study of Singh et al. (2017) [47] more than 80% of all the HWs had correct knowledge regarding initiation of breastfeeding, prelacteal feeding, colostrum, exclusive breastfeeding, and complementary feeding. Similarly, Saxena and Kumari (2014) [48] study revealed that more than 80% of the HWs had complete and correct knowledge about exclusive breast feeding, complementary foods and their consistencies that can be fed to young children.

Finally, some limitations of the study have to be taken into consideration. It is important to note that the study was carried out at only 21 conveniently selected public CWCs without including CHPS compounds where GMP activities are also offered by HWs. Therefore, since other health facilities such as Community-based Health Planning and Services (CHPS) compounds and private clinics were not selected and captured in the study, it presents some form of selection biases which limits the study's representativeness and possibility to generalize the findings to the entire population of HWs in the study area. Again, because the 21 CWCs were not randomly selected, it also introduces sampling biases into the study. In addition, participation of health workers was voluntary and therefore since some HWs did not willingly volunteer to respond to the questionnaire, some form of selection bias was present in this study influencing the interpretation of the findings. Nevertheless, the study has successfully revealed some knowledge gaps of HWs on child nutrition that can be used in the planning of educational interventions that are aimed at improving their awareness of recommended IYCF practices and GMP activities particularly in the study area and perhaps other similar rural settings.

Conclusion

The results of this study indicate that there are gaps in the nutritional knowledge of health workers offering health services at child health facilities and that their ability to counsel caregivers on recommended IYCF practices particularly in the absence of a dietician remains questionable. The findings also suggest that although generally HWs are able to interpret the various growth curve patterns, there are gaps in their knowledge levels with respect to the actions that should be undertaken after interpreting growth curves of children. The study also provides clear evidence that HWs working in child health facilities need more education in child nutrition which can be organized in the form of workshops and refresher courses to enable them update their knowledge levels.

Findings from this study can provide guidelines in designing effective child nutritional educational programmes for HWs in order to improve their competencies in counselling caregivers and offering growth monitoring and promotion services. The findings also suggest that there is the need for regular monitoring and evaluation of nutritional services provided to caregivers to ensure that HWs communicate the recommended IYCF practices to them. Such regular supervisory and monitoring activities could be undertaken by District Nutrition Officers at CWCs in order to identify inappropriate GMP practices and contradictory nutrition information that may be shared with caregivers. There may also be the need for in-service training of HWs in order to enable them update their knowledge levels on recommended IYCF practices which will improve their capacity to impact nutritional information to caregivers.

The findings of the present study also have implications on the need to consider and revise modalities pertaining to the recruitment of HWs posted to child health facilities. Another recommendation is to consider the possibility of restricting services offered in child health facilities such as the CWCs to only paediatric nurses and midwives which warrants the need to strengthen and expand paediatric nursing training programmes in Ghana. Other HWs such as mental health nurses, disease control officers and community health volunteers as a result of

perhaps not being adequately trained in child health issues should be posted to other departments in health facilities.

A suggestion for further study is to assess whether participation in nutrition education programmes for HWs can improve upon their knowledge levels and GMP services that are offered to children. Another suggestion is to find out whether nutritional information given to caregivers by HWs influences caregivers' IYCF practices, the dietary adequacy and nutritional status of their children.

Ethical Approval and Consent

Ethical clearance and approval for the study was obtained from the Institutional Review Board (IRB) of Dodowa Health Research Centre, Ghana Health Service and the IRB of University of Cape Coast, Ghana. Signed-informed consent was obtained from each health worker after informing them on the purpose, need and benefits of the study.

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