

Full Length Research Paper

Nutritional quality of meals served under the Ghana school feeding programme at the Upper West and Central Region of Ghana

Kate Bigson^{1*}, Edward Ken Essuman², Vida Gyimah Boadu³ and Gifty Serwaa Otoo⁴

¹Department of Catering, Hotel and Institutional Management, Wa Polytechnic, Wa, Ghana.

²Department of Nutrition and Dietetics, School of Allied Health Sciences, University of Health and Allied Sciences, Ho, Ghana.

³Department of Hospitality and Tourism Education, Faculty of Vocational Education (FVE), University of Education, Winneba, Ghana.

⁴Department of Agricultural Engineering, College of Agriculture and Natural Sciences, University of Cape Coast, Ghana.

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This research evaluated the nutritional quality of meals that were served to school children under the Ghana School Feeding Programme in Wa and Cape Coast. A cross-sectional and descriptive survey research designs were employed from which purposive and simple random sampling technique was adopted. In all, a total of 720 respondents were selected and that comprised 600 pupils, 60 teachers and 60 kitchen staff. Data were also obtained using questionnaire, observation and unstructured interview instruments. The data were then analysed with database and statistical software such as SPSS, ESHA, FNPD and USDA National Nutrient Database for Standard Reference. Qualitatively, the findings revealed that meals served in the schools had most of the needed food nutrients. However, the mean daily nutritional values intake of the pupils in the schools in both studied areas did not meet the recommended nutrient intake value. It is therefore recommended that the government should enhance the nutritional quality of the meals served to the pupils by supplying vitamin supplements. Again, the government should consult experts in food and nutrition in each region to redraw menu which has nutritional benefits from locally grown foods.

Key words: Variety of food, recommended nutrient intake, nutrients, leafy vegetables.

INTRODUCTION

Malnutrition in school age children (SAC) in Ghana is known to affect the children's school attendance, lower their academic achievement and cognitive levels (Parish and Gelli, 2015), besides causing stunted growth and wasting. To curb the malnutrition and its associated

consequences among the SAC, Government of Ghana adopted a School Feeding Programme (SFP) as a solving tool in the year 2005. This choice which is supported by research findings of Muthayya et al. (2009) had been effectively adopted by many developing

*Corresponding author. E-mail: katedjbigson@gmail.com.

countries. According to Muthayya et al. (2009) meals served in school always increase the nutritional status of SAC and in a variety of ways. However, after the implementation of the programme in Ghana, very little data have been gathered to verify the milestone covered towards the goal, so as to ascertain whether or not the malnutrition in targeted schools has truly dwindled.

Abdul-Rahman and Agble (2012) revealed that data regarding the nutritional values of the meals served under the programme are scanty and as well, data of responsiveness of the targeted pupils to the programme are very much lacking. Additionally, fewer impact studies that had been undertaken had also yielded contrasting outcomes. For example, Owusu (2013), on one hand, revealed that the SFP by the government did not meet the required standard nutritional values but Parish and Gelli (2015) and Buhl (2010), on the other hand, claimed otherwise. Obviously, the result of impact studies of the programme indicates that the outcome is inconsistent and varies from region to region. One of the reasons for this inconsistency has been attributed to the varying levels of nutrients in indigenous diet that are prescribed in the menu.

For this reason, gaining a clearer picture of the extent of the impact of the programme and its adoption dictates that studies on each and every participating school ought to be thoroughly done. This is because schools are only instructed to provide a nutritious meal daily and in most districts, menus are said to be prepared with assistance from a nutritionist. However, menus are often not displayed and are not always followed (Netherlands Development Organisation, 2007). Currently, there is lack of information regarding how much nutrients and calories are in the meals that are being served to the SAC. It is against this background this study seeks to determine the nutritional contents of the meals that are served in Wa and Cape Coast schools and whether they do meet the required levels that SAC need to be well-nourished.

MATERIALS AND METHODS

Study area

The study was conducted in two major capital towns, Wa and Cape Coast in the Upper West and Central Region of Ghana, respectively. The choice of schools for the study was based on Ghana population and housing census 2010 (Ghana Statistical Service, 2012) data that points to the three northern regions (Upper East, Upper West and Northern Regions) and the Central Region as the poorest regions in Ghana. This, therefore, led to the selection of Wa and Cape Coast in the research study. Schools in Cape Coast include 9 public second cycle institution, 3 private second cycle institution, 120 junior high schools, primary schools and pre-schools belonging to both public and private sectors. There are also 14 schools under the school feeding programme. Each school had an average of 300 students. A major market is located in the Cape Coast Township with market days throughout the week. Smaller markets exist in most communities like Abura and Efutu. Also, the Wa Metropolis has 68 schools participating in the Ghana School Feeding Programme (GSFP) with an average population of 300 pupils in a school.

Study population

The target population included all head teachers, teachers, pupils and kitchen staffs found within schools benefitting from GSFP in the Wa Municipality and Cape Coast Metropolis. The choice of head teachers, teachers, pupils and kitchen staffs, therefore, enabled generation of first-hand information on the nutritional adequacy of meals served under the GSFP.

Sample size

A total of 720 respondents participated in the study. This sample size was computed using Graph Pad Prism Version 16, statistical software. It used the following parameters: standard normal variance (at 5% type 1 error; $P < 0.05$), a critical z-score of 1.96% and at 1% type 1 error ($P < 0.01$) with $95\% \pm 2.58$ confidence interval. P values are considered significant below 0.05.

Sampling techniques and instrumentation

Non-probability sampling using purposive sampling was employed to identify public schools benefitting from the GSFP in both Wa and Cape Coast. Probability sampling using simple random sampling method was used to select 12 schools out of the 68 schools under the School Feeding Programme from Wa, while 8 out of 14 schools were selected from the Cape Coast School Feeding Programme. A pre-tested standardized validated questionnaire consisting of closed-ended questions with multiple choice answers and open-ended questions was used to solicit information on the nutritional quality of meals prepared. An unstructured observational guide was developed to gather additional information.

Nutrient determination in meals

Weights of food ingredients used in preparing the meals per day were measured using a Mettler 346 L weighing scale. These values were obtained by taking the weights of each food ingredient used in preparing the meals, for all the participating pupils in one school per day. The captured weights of the ingredients were then fed into ESHA Food Nutrient Processor Database software to estimate their nutritional values. ESHA spews out weights of nutrients per 100 g of the inputted ingredient. To obtain the actual weights of the nutrients from the meal, the outputs from ESHA were multiplied by the right proportion to make up to the actual weight of the tested meal ingredient. This process was repeated for all the various food ingredients used to prepare each meal throughout the 5 day study period. The mean daily intake of nutrients in meals over the study period was done arithmetically summing all the values for each nutrient from each meal for the 5 day study period. The resulting values were divided by the 5 days followed by the number of the participating pupils. The data were then fed into USDA National Nutrient Database for Standard Reference (2013) to establish the nutritional values of the meals. Also, meals served to the pupils in the schools that fall under the research study were weighed to ascertain whether the meals served to pupils met the weight of food needed to be served to them.

Data analysis

Data cleaning preceded the analysis; this was done using SPSS version 20.0 (2011), Graph Pad Prism (trial version 5), Microsoft Excel 2007; and PAST Statistics/data analysis software. The various nutritional contents of meals were calculated using ESHA results

Table 1. Menu prescription observed in Wa and Cape Coast municipal schools.

Day	Meals served at school	
	Wa municipal	Cape Coast municipal
Monday	Rice and beans with tomato stew or groundnut soup	Rice with tomato stew
Tuesday	Tuo Zaafi with green vegetable soup or dry okro soup	Banku with okro soup or groundnut soup
Wednesday	Gari and beans	Gari and beans
Thursday	Banku and groundnut soup	Gari with palava sauce or tomato stew
Friday	Jollof rice	Rice and beans with tomato stew or Jollof rice

Food Nutrient Processor Database (trial version). Both descriptive and inferential statistical tool was used for data analysis and presented using frequencies and means of the information gathered.

Ethical considerations

Ethical clearance was sought from Ghana Education Service district offices, the head teachers in the various schools under GSFP and the Board of Ethical Clearance Committee of the University of Education, Winneba-Ghana.

RESULTS

Meals served to pupils under the GSFP

Meals served to the schools in both Wa and Cape Coast were about the same regarding the days as shown in Table 1. The meals served in various schools in both towns were made with rice, maize, or cassava. The added stews and soups and their contents differed from time to time in each area. Some of the meals served in the Cape Coast Metropolis schools, for instance, included rice and tomato stew, gari (pinno) or eba (Nigeria) and palava sauce while banku and groundnuts soup, tuo zaafi and ayoyo soup (a popular dish for the people of Ghana) among others were served in the Wa schools. The most common meals served in both schools were gari and beans.

Observation made under the SFP in Wa municipal

It was observed that the meals served in Wa schools usually contained more green leaves and vegetables. Further, the kitchen staff strictly adhered to the menu given by the district office. The caterers prepared and serve meals prior to the time the pupils go out for break for lunch and this was observed in all the schools under this study.

Observation made under the SFP in Cape Coast Metropolis

The situation at Cape Coast schools was somewhat

different. Although the schools had been given a menu, the menu was not strictly followed. However, by the end of the week, all the meals that were on the menu were prepared and served.

Mean daily intake of nutrients in the schools' meals

The mean daily energy and nutritional value of intakes determined in 5 day studies of ingredient per meal served to pupils in both Wa and Cape Coast schools are shown in Table 2.

The resulting nutritional value was compared with one-third of the Recommended Nutrient Intake (RNI) value of WHO/FAO (2004). It was found that the daily nutrients of the meals served to the school going children in both schools in the municipal were below the RNI values.

Types of animal products used in meal preparation

The responses to the type of animal products that the pupils, teachers, and kitchen staff identified to be used to prepare meals in Wa and Cape Coast schools are shown in Table 3. In both Wa and Cape Coast schools, all the respondents (100% of the pupils, teachers, and kitchen staff) stated that fish was used in preparing meals. The animal products used by the caterers in Cape Coast Metropolis' schools were fish powder of herrings and anchovies, tuna and occasionally chicken to prepare the meals while in Wa schools were mainly fish (anchovies). Anchovies are smaller fishes and they further get broken into smaller pieces during the cooking preparation making it not obvious for one to see the presence of the fish in the food. The schools in both Wa and Cape Coast indicated that beef and eggs were not served to them at all, except during the last day of vacation termed "Our Day". It is during this day that the pupils of Cape Coast schools had chicken on their meals and the size was as small as palm kernel.

Observations made under the SFP on types of food ingredients used in meal preparation

From the perspective of the caterers, when an ingredient is scarce for any reason either an alternative ingredient is

Table 2. Mean daily intake of nutrients in meals served for a 5 day study in Cape Coast and Wa municipal schools.

Nutritional component (1/3 RNI)	Mean± SD	
	Wa Municipal	Cape Coast Municipal
Calories (720 kcal)	520.6±30.1	440.8±20.1
Protein (14 g)	10.2±0.9	10.8±0.8
Carbohydrates (43 g)	90.6±6.3	69.3±5.2
Vitamins A (200 µg RE)	726.4±85.2	548.2±75.1
Thiamin (0.4 mg)	0.2±0.1	0.3±0.2
Riboflavin (0.4 mg)	0.1±0.1	0.1±0.2
Vitamin C (13.3 mg)	8.4±0.3	6.7±0.4
Iron (5 mg)	4.0±0.4	3.3±0.3
Calcium (433.3 mg)	84.6±8.3	92.8±9.4
Zinc (3 mg)	1.9±0.2	2.3±0.3

Table 3. Animal products used to prepare meals for school children in Wa and CapeCoast schools.

Animal product	Wa respondents						Cape Coast respondents					
	Pupils (n=360)		Teachers (n=36)		Kitchen staff (n=36)		Pupils (n=240)		Teachers (n=24)		Kitchen staff (n=24)	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Beef	0	360	0	36	0	36	5	235	0	24	0	24
Fish	360	0	36	0	36	0	240	0	24	0	24	0
Eggs	0	360	0	36	0	36	0	240	0	24	0	24
Chicken	0	360	0	36	0	36	59	181	3	21	0	24
Others	4	356	*NA	NA	NA	NA	3	237	NA	NA	NA	NA

*NA = Not available.

Table 4. Types of legumes and nuts used for meal preparation in Wa and CapeCoast schools.

Legumes and nuts	Wa respondents						Cape Coast respondents					
	Pupils (n=360)		Teachers (n=36)		Kitchen staff (n=36)		Pupils (n=240)		Teachers (n=24)		Kitchen staff (n=24)	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Black eye beans	360	0	36	0	36	0	240	0	24	0	24	0
Groundnuts	360	0	36	0	36	0	230	10	22	2	24	0
<i>Agushie</i>	3	357	6	30	3	33	126	114	15	9	12	12
Soyabeans	2	358	10	26	12	24	6	234	6	18	5	19
<i>Dawadawa</i>	358	2	34	2	36	0	6	234	2	22	5	19
Palm fruit	0	360	3	33	3	33	10	230	2	22	6	18

used or none at all. An interview with a caterer in Cape Coast revealed that sometimes processed meat like sausages were used to cook for the pupils instead of fish. Table 4 represent the major types of legumes and nuts used for meal preparations and these were beans and groundnuts.

The respondents from Wa schools revealed that *dawadawa* was used in their meals preparation. Soya bean was the least used legume, according to the pupils. However, the teachers in Wa claimed that palm fruit was

the least used ingredient followed by *agushie*, and this claims were supported by the kitchen staff. At Cape Coast, all the respondents stated that beans were the most used ingredient for meal preparations. For *agushie* usage, there was a split decision among caterers and the pupils. The least used ingredients were soybeans and *dawadawa*, according to the pupils and teachers but the kitchen staff claimed that they used soybeans. It was observed that caterers in Wa use soybeans in the form of powder after it has been roasted and milled. The roasted

Table 5. Types of cereals and grains used for meal preparation in Wa and Cape Coast Municipal school.

Cereals and grains	Wa respondents						Cape Coast respondents					
	Pupils (n=360)		Teachers (n=36)		Kitchen staff (n=36)		Pupils (n=240)		Teachers (n=24)		Kitchen staff (n=24)	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Maize	359	1	36	0	36	0	220	20	24	0	24	0
Rice	356	4	36	0	36	0	240	0	24	0	24	0
Millet	2	358	4	32	2	34	1	239	0	24	0	24
Sorghum	0	360	4	32	2	34	0	240	0	24	0	24

Table 6. Fruits and vegetables used to prepare meals for pupils in Wa and Cape Coast municipal schools.

Fruits and vegetables	Wa respondents						Cape Coast respondents					
	Pupils (n=360)		Teachers (n=36)		Kitchen staff (n=36)		Pupils (n=240)		Teachers (n=24)		Kitchen staff (n=24)	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Banana	4	356	0	36	0	36	3	237	0	24	0	24
Mango	0	360	0	36	0	36	0	240	0	24	0	24
Local green leaves	360	0	30	6	36	0	97	143	8	16	19	5
Okra	320	40	36	0	36	0	136	104	10	14	20	4
Garden eggs	6	354	10	26	2	34	8	232	5	19	15	9
Tomatoes	355	5	36	0	36	0	228	12	24	0	24	0
Pepper	359	1	36	0	36	0	234	6	24	0	24	0
Onion	344	16	36	0	36	0	240	0	24	0	24	0
Cabbage	2	358	2	34	6	30	2	238	2	22	4	20
Carrot	1	359	0	36	2	34	1	239	0	24	2	22

soybeans powder was mixed with groundnut paste to prepare soup. Again, the pupils in Wa had more soups in their menus due to the abundance of edible local green leaves in the region. In Cape Coast, the researchers again observed two caterers who soaked soya beans overnight, milled them into a paste and used them to substitute *agushie* to prepare palava sauce.

Table 5 represents the grains and cereals used in meal preparation in both Wa and Cape Coast SFP. Almost all the respondents agreed that maize and rice were the most used grains and the least used were millet and sorghum. In Cape Coast, less than 1% reported that millet or sorghum was ever used. The most used cereals and grains were rice and maize. From Table 6, it can be seen that local green leaves were often used in meal preparation in Wa. These local green leaves included cassava leaves, pumpkin leaves, beans leaves and baobao leaves. Not much green leaves were used, according to the pupils in Cape Coast. The kitchen staff, however, indicated that more substantial local green leaves were used contrary to the pupils' claim. It was observed that all the schools' caterers used canned tomatoes rather than the fresh one. According to the caterers, they only used fresh tomatoes during its season and when it is very cheap at the market.

Types of starchy roots (processed) used to prepare food for pupils

Table 7 shows the types of starchy roots (processed) used in meal preparation. Fresh cassava was barely served in the schools. Majority of the respondents in Wa reported that *konkonte* was rather used for the preparation of meals. In Cape Coast, on the other hand, the kitchen staff indicated that *konkonte* was not used at all. It is clear that gari was the most used processed starchy root used in meal preparations.

In Wa Municipal schools, *konkonte* was not served as such but the powder is usually mixed with corn dough to prepare banku and with corn flour to prepare tuo zaafi. It was also observed in Cape Coast schools that fresh cassava was made into dough and mixed with corn dough to prepare banku. Hence in both Wa and Cape Coast, processed cassava was used instead.

Type of fat and oil used to prepare foods for pupils

Table 8 shows the types of fats and oils used in the meal preparation of the SFP. The main oils used in the meal preparation for both schools in Wa and Cape Coast were

Table 7. Starchy roots (processed) used to prepare meal for pupils in Wa and Cape Coast Municipal schools.

Starchy roots	Wa respondents						Cape Coast respondents					
	Pupils (n=360)		Teachers (n=36)		Kitchen staff (n=36)		Pupils (n=240)		Teachers (n=24)		Kitchen staff (n=24)	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Fresh cassava	6	354	1	35	2	34	6	234	1	23	1	23
<i>Konkonte</i>	329	31	35	1	36	0	36	204	1	23	0	24
Gari	324	36	36	0	36	0	240	0	24	0	24	0
Others	45	315	23	13	10	26	12	228	2	22	7	17

Table 8. Fat and oil used to prepare meals for pupils in Wa and Cape Coast Municipal School.

Fats and oils	Wa respondents						Cape Coast respondents					
	Pupils (N=360)		Teachers (N=36)		Kitchen staff (N=36)		Pupils (N=240)		Teachers (N=24)		Kitchen staff (N=24)	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Vegetable oil	360	0	36	0	36	0	240	0	24	0	24	0
Coconut oil	5	355	2	34	0	36	10	230	1	23	0	24
Palm oil	360	0	36	0	36	0	240	0	24	0	24	0
Kernel oil	2	358	1	35	0	36	1	239	1	23	0	24
Shea butter	8	352	5	31	15	21	8	232	3	21	4	20
Margarine	1	359	0	36	0	36	3	237	0	24	0	24
Others	1	359	6	30	6	30	1	239	4	20	4	20

Table 9. Mean Weights of meals served in schools in Wa and Cape Coast municipals.

School	Gari balls and tomato stew	Gari and Bean	Rice and tomato stew	Rice and beans with tomato stew	Banku and okro soup	Banku and groundnut soup	Rice with palava sauce	Jollof Rice	Tuo Zaafi with green vegetable soup
	FAO Standard (2012)								
	400 g	310 g	550 g	450 g	650 g	650 g	600 g	450 g	700 g
Meals at Wa 1	NA	210	193	192.5	NA	342	*NA	195	400
Meals at Wa 2	NA	217	191	190.5	NA	347	NA	201	392
Meals at Cape Coast 1	178	184	179	NA	202	NA	188	NA	NA
Meals at Cape Coast 2	180	186	199	NA	199	NA	186	NA	NA

*NA = not available.

vegetable cooking oil and red palm oil, according to the kitchen staff. Shea butter was also used in preparing vegetable soup for tuo zaafi in some of the schools in Wa Municipal.

Mean weights of meals served

The mean weights of meals served in the two schools in both Wa and Cape Coast are shown in Table 9. For the sake of anonymity the schools were given numbers 1 and 2. The results revealed that the mean weight of the meals

served to the pupils was consistently below the FAO standards (2012).

DISCUSSION

Meals served to pupils under the GSFP

The study revealed that varieties of meals were served in both cities. According to Wardlaw et al. (2004), eating a variety of diets is essential to meeting the nutritional needs of an individual. This is because the caterers

incorporate variety of food ingredient in the meal preparation. One critical observation made was that the menus at both places of the study were fundamentally the same but the main meals given to the pupils differed in terms of added stew or soup. However, what is served to complement the stew or soup at both places was mainly from maize, cassava or rice which was consistent with staple food, generally eaten by Ghanaians along the coastal and the middle belts. Meals made from the same staples were also noted by Okae-Adjei et al. (2016) to be served at schools in Akuapem North Municipality. It is however surprising to note that millet and sorghum-based meals were absent from the menu in Wa. This is because, in the northern parts of Ghana including Wa, the staple food of the people is made from *kokonte* (dried cassava), maize, millet and sorghum. This suggests that the menus were possibly designed outside Wa Municipal which did not consider the culture of meals eaten by the indigenous pupils. Cisse et al. (2015) noted that the indigenous staple grains of millet and sorghum were more beneficial than non-traditional grains.

Information also gathered from the kitchen staff and teachers in Cape Coast revealed that jollof rice which ought to be served regularly under the prescribed menu of the school was rather served during special days or sporting activities. Gari, beans and rice were among the most frequently served meals in Wa and Cape Coast municipal schools and which suggests that gari, beans and rice are cheaper and more easily acquired by caterers in Ghana. In Wa, meals usually contained local green leaves and vegetables like baobab leaves, cassava leaves, pumpkin leaves, ayoyo leaves, and spinach which are rich in minerals and vitamins. Meals given to the school children in Wa had more soup, which made the pupils more able to completely consume their meals and this was unlikely in Cape Coast Metropolis schools where the meals served were mostly solid with oily stew. The frequent use of local green leaves may have accounted for the increase in micro-nutrient contents in the meals in Wa schools than Cape Coast schools.

Another observation made was that the schools in Wa Municipality strictly adhered to the menu given by the GSFP secretariat while caterers in Cape Coast did not. An interview with a caterer in Cape Coast revealed irregularity in the payment of the feeding grant which compelled them to prepare meals from ingredients that were available and more easily accessible with their limited purchasing resources. Nonetheless, by the end of the week, all the meals that were on the menu had been prepared when the ingredients were available and acquired. A survey by Abdul-Rahman and Agble (2012) showed that availability of the ingredients used in meals was also dependent on farming seasons, procurement procedure and availability of funds. In the dry seasons when many vegetables were unavailable, caterers resorted to dried vegetables for the meals.

Mean daily intake of nutrients in the schools' meals

Findings in relation to nutritional quality of meals served to upper primary schools revealed that the meals served, as of 2015, in both Wa and Cape Coast Municipals schools did not meet the nutrient intake recommendation based on WHO/FAO (2004), with the exception of carbohydrates and vitamin A which far exceeded the limits. This means that the pupils were not acquiring the needed nutrients that the programme ought to supply. Also, the school feeding programme does not take into consideration the recommended dietary allowance of calories and nutrients of the students based on their gender and age. All the school going children are served the same quantity of meal. These findings were consistent with studies reported by Abdul-Rahman and Agble (2012) who revealed that the meals at some schools in Accra and the Northern Regions of Ghana provided less than 30% of the daily RNI. These agree with Owusu (2013) who confirmed that various nutrients in meals under the GSFP at Sub-urban in Ghana also conform to the findings of this research. The results of this study again, reveal that energy, carbohydrates, vitamin A, and iron contents were high in Wa schools than in Cape Coast schools. In Wa, groundnut soup was usually thickened with soya bean powder besides the usage of green leafy vegetables. It was therefore not surprising that the vitamins in the meals in Wa schools were relatively high than those in Cape Coast schools.

Parish and Gelli (2015) pointed out that meals in Tamale and other cosmopolitan areas close to Wa that had similar socio-environmental characteristics contained more calories than meals in Accra. This study finding reveals that calcium, protein, thiamin, and zinc were higher in Cape Coast than in Wa municipal schools. The high value recorded for calcium intake in meals served to the pupils of Cape Coast could be due to the availability of fish in Cape Coast, hence a cheap source of protein (fish) used in meal preparations; this might be responsible for the differences in the calcium contents despite other calcium sources from green leafy vegetables, nuts and soybeans which were used by caterers in both cities.

Types of food ingredients used in meal preparation

Meals served in Cape Coast schools where the SFP is in operation had more of their protein source from fish. Cape Coast is a coastal city and more likely to have access to cheaper marine fish unlike meals served in Wa schools where there are fewer rivers and streams. Although the pupils of Cape Coast schools eat chicken occasionally, it was woefully inadequate. Although fish is considered as a healthy protein source, the pupils in Wa schools did not have an adequate amount. It is not surprising that the protein content of the meals in Cape

Coast was higher than that in Wa municipal. The choice for the use of fish or chicken is dependent upon the caterers. Chicken in many parts of the country is considered a delicacy but this is eaten by the school children only on special occasions.

The major types of legumes and nuts used for meal preparation were beans and groundnuts. These are two vital ingredients which are of good benefit to human health. Beans are a super healthy, versatile and affordable food high in antioxidants, fibre, protein, B vitamins, iron, magnesium, potassium, copper and zinc. Eating beans regularly may decrease the risk of diabetes, heart disease, colorectal cancer, and helps with weight management (Messina, 1999). Groundnuts are also known to contain health benefit nutrients such as minerals, antioxidants, vitamins, oleic acid and mono-saturated fatty acids. Consumption of mono-saturated fatty acids helps to prevent the risk of coronary artery disease and stroke.

Respondents in Wa municipal schools revealed that *dawadawa* was used to prepare meals for them and its usage was far more than *agushie* and soybeans. This is possible because *dawadawa* is an indigenous food ingredient to the people of Wa. Furthermore, *dawadawa* contains significant amounts of major and minor nutrients needed by the human body. *Dawadawa* serves as a flavouring agent and imparts sensory appeal to foods and possesses medicinal value in addition (Teye et al., 2013).

The pupils, teachers and kitchen staffs identified maize and rice as the main cereals used in food preparation. This was not surprising because they were the main staples of the schools' menu. Nevertheless, it was amazing to see millet and sorghum which are popular grains in the Northern part of the country could not find their place in the school feeding programme menu. The reason for the absence of these cereals in the menu is unclear but it can only be speculated that their absence suggests that the menu was designed from the southern part of Ghana by officials who might not be accustomed to the use of the said grains. It may also be that their prices were high than the other staple foods.

The use of okra in meal preparations was a typical practice of the natives of Wa Municipality. Okra, spinach, cassava leaves, pumpkin leaves, and baobab leaves are staple vegetables used by Wa natives regularly for their meals. This is contrary to natives of Cape Coast who do not actually have a staple vegetable except some occasional use of okra and green leaves in their diets. From these results, a variety of ingredients are used to prepare meals for pupils in both Wa and Cape Coast schools. According to Whitney et al. (2001) using a variety of ingredients in diets contributes immensely to achieving the RNI. It was observed that most of the ingredients, like tomatoes, pepper, and other vegetables were canned and okra and green leaves were sometimes also dried and milled into a powder. The issue with such processed products is that they tend to lose their

nutritional contents during the processing and other unknown effects on the pupils due to the addition of preservatives and additives to extend the shelf life. The uses of processed ingredients like canned tomatoes may also increase the risk of food safety especially when the sources and shelf life of the canned ingredients are not checked or unknown.

Dried cassava or *konkonte* and gari were the starchy roots in a processed form that were used to prepare meals for the school children. It is not a surprise that gari is one of the most used starchy food ingredient for meal preparations. A similar report has been made by Parish and Gelli (2015) on gari and beans as being the most eaten meals in most Ghanaian schools. The combination of beans and gari as a meal is very satisfying when ingested and it is easier to prepare and cheaper than most meals. Majority of the respondents (kitchen staff) in Wa indicated that *konkonte* was the most used starchy product for the preparation of meals but in Cape Coast, it was not used at all. *Konkonte* is one of the main ingredients in the preparation of tuo zaafi, a local traditional dish consumed mostly by the people of the Upper West Region whose capital is Wa.

Shea nut oil which was also identified to be used in preparing vegetable soup for tuo zaafi was used only in Wa but not in Cape Coast probably because the shea nut tree is found only in the Wa area. The oil from the nut is rich in vitamin C and has anti-inflammatory and antioxidant properties. Kao et al. (2016) described its application and healing potency on attenuating knee osteoarthritis of rats and its use to cure arthritis in humans. Palm oil also contains antioxidants, carotenes, vitamins E and A, vital nutrients for sight. Vitamin A deficiency is the leading cause of preventable childhood blindness and lowers cognitive functions (Hornby et al. 1999). Palm oil is a regular component of gari and beans meal which was observed to be the most frequently eaten meal in the GSFP across the country. It is therefore not surprising that vitamin A was the only vitamin that met the RNI of the meals.

Conclusion

Meals served under the GSFP in Wa and Cape Coast Municipal schools contain almost all the major nutritional contents which are protein, carbohydrates, vitamins, iron, calcium, and zinc. This is so because varieties of meals were served at the schools. However, the total nutritional contents of meals served in both Wa and Cape Coast did not meet the recommended dietary intake prescribed by World Health Organization (WHO). It is therefore recommended that government consult experts in food and nutrition in each region to draw menu which has nutritional benefit to the pupils using locally grown foods in each region and ensure strict adherence.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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