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THE NUTRITIONAL CONTENT OF FOODS SERVED IN THE SCHOOL FEEDING PROGRAM IN BASIC SCHOOLS IN GHANA

Bernice Nana-Mireku[1],
Charles Amoah Agyei[2i],
Marvel Hinson[3],
Florence Harvey[4]
[1]St. Francis Senior High Technical School,
Department of Home Economics,
Akim Oda, Ghana
[2]Akenten Appiah-Menka University
of Skills Training and Entrepreneurial Development,
Department of Integrated Science,
Asante Mampong, Ghana
[3]Cape Coast Technical University,
Department of Hospitality Management,
Cape Coast, Ghana
[4]Methodist College of Education,
Science Department,
Akim Oda, Ghana

Abstract:
The purpose of the study was to evaluate the nutritional content of food served in the school feeding programme in basic schools in Ghana. The research design adopted for this study was a descriptive survey design. A simple random sampling procedure was used to draw a sample of 4 schools out of 19 schools in Birim Central municipality. In all, there were 23 teachers, four head teachers and 15 cooks selected for the study. Questionnaire and chemical analysis processes were used to collect data for the study. The result of the study indicated that the nutritional content of food served to children under the SFP failed to meet at least 50% of the RDI based on 2400 kilocalories. Results showed that the nutritional content of meals served to pupils under the SFP did not meet 50% RDI for school lunches. However, caterers had a high level of nutritional knowledge and the majority of them had a positive attitude towards nutrition education. It was recommended that food commodities that have a high concentration of various nutrients (protein, carbohydrate, fat and oil, vitamins and minerals) should be used instead of using those that have low concentrations.

[i] Correspondence: email akwesiamoah2003@yahoo.com

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1. Introduction

According to the 2007 Food and Agriculture Organization's (FAO) estimate, 923 million people in the world are chronically hungry, which is an increase of about 75 million people from the 2003-05 estimates (FAO, 2008). Many of these were children and a vast majority of them were in developing countries. The persistence of hunger, malnutrition and micronutrient deficiencies can have long-lasting effects on the health status and productivity of people and their nations. Early malnutrition can adversely affect physical, mental, and social aspects of child health, which in turn leads to underweight, stunted growth, lowered immunity, and mortality.

Research has shown that the physical effects of malnutrition as measured by indicators such as body mass index (BMI) have a significant impact on an individual's productivity and wages (Broca & Stamoulis, 2003). Childhood under nutrition imposes significant economic costs on individuals and nations, and improving children's diets and nutrition can have positive effects on their academic performance and behaviours at school as well as their long-term productivity as adults (Jomaa, McDonnell & Probart, 2011). Alderman, Hoddinott and Kinsley (2006) found that malnutrition led to delayed entry to school, less overall schooling, smaller stature, and 14% lower earnings as adults. Policymakers may use a number of interventions to target various groups within a population through social safety nets to address the problem of hunger and malnutrition. School feeding offers an excellent opportunity for targeted intervention in this age group, both as a means for enhancing nutrition and improving school attendance and educational outcomes.

School-age children are particularly vulnerable to undernutrition, as the priority in nutrition interventions is often to prevent malnutrition during fetal development and the first years of life which are the most critical periods for growth and development (Brundy, Burbano, Grosh, Gelli, Jukes & Drake, 2009). Progress toward these ends is directly in line with the Millennium Development Goals 1 and 2 namely: to halve the proportion of people who suffer from hunger around the world and to ensure that all children are able to complete a full course of primary school (United Nations Millennium Development Goals, 2008).

Though school feeding programmes cannot reverse the consequences of earlier malnutrition, the literature demonstrates that providing meals at school can have a significant impact on nutritional status and educational outcomes in children (Brundy *et al.*, 2009). It contributes to the diversification of the diet of school children, especially those from poor households. Through increasingly diversified diets, school children are more likely to increase the consumption of micronutrients. Improvement in micronutrients status of children contributes to improved cognition. There is ample evidence that reduction in iron deficiency improves cognitive functions across all age

groups. Iron interventions have been found to have a positive impact on infant development scales, IQ tests and school achievements (Grantham-McGregor & Ani, 2001).

Girls who are better nourished are more attentive and involved during class, and well-nourished boys exhibit improved classroom behaviour and activity levels (Bundy, Shaeffer & Jukes, 2006). School feeding programmes have also demonstrated the potential for improved educational attainment. Studies from Jamaica, Kenya, Bangladesh, the Philippines, and Uganda found increases in test scores, with many of these programmes also demonstrating improved attendance and study skills (Ahmed, 2004). Evidence from randomized controlled trials also shows that school feeding programmes increased enrollment and reduced dropout rates (Brundy *et al*., 2009). Quite simply, school feeding programmes keep school children in school and support learning by alleviating short-term hunger and improving health and cognitive abilities. Such programmes have long-term implications for national development and social protection and the growth of productivity and social capital.

The Ghana School Feeding Programme (GSFP) was started in 2005 as a pilot project of Comprehensive Africa Agricultural Development Programme (CAADP), Pillar 3 of the New Partnership of Africa Development in 2006. Within a year of the pilot, the GSFP was expanded as part of efforts of the Government of Ghana to accelerate the achievement of the Millennium Development Goals related to poverty, hunger and education (Abosti, 2013). The GSFP started with ten schools, one in each region of the country. By August 2006, it had been expanded to 200 schools covering 69,000 pupils in all 138 then existing districts of the country.

The next phase of the GSFP began in 2007 with nationwide coverage in all 170 districts with 346 schools. By the end of the first quarter of 2011, the programme fed 713,590 children in all the beneficiary schools nationwide (Abotsi, 2013). The school feeding programme targets the following groups among the Ghanaian communities: (a) Deprived districts in terms of poverty reduction strategy (GPRS) classification, (b) Poorest and the most food insecure districts, (c) Low wealth level districts, (d) Low school attendance rate (high absenteeism) districts, and (e) High school dropouts districts (Abotsi, 2013).

In Ghana, there are no nationally established nutrition guidelines for school feeding programmes. Schools are 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. It is due to this lack of information about the nutritional composition of the meals that this research is partly being conducted.

2. Statement of the Problem

Nutrition has a powerful influence on a child's growth and learning abilities. Children who lack certain nutrients particularly iron and iodine in their diet, or who suffer from

protein-energy malnutrition, hunger, and other health-related diseases, do not have the same potential for learning and growing up properly (Ahmed, 2004). According to Whitney and Rolfes (2008), approximately 14% of the world's population experiences persistent hunger and 60% of deaths of children globally may be attributed to nutrition insecurity. According to Kloka (2003), nutrition insecurity is a situation where physical and economic access to a balanced diet and safe drinking water for all people at all times is not assured. Thus, the vice versa of nutrition insecurity explicitly explains the meaning of nutrition security.

With respect to children and nutrition security, Gokah (2008) is of the view that access to a balanced diet and safe drinking water is particularly vital throughout a child's school attending period. This is because; nutrition security provides children with opportunities to express their full innate potential in physical and mental development. With respect to this, the GNSFP has an obligation to ensure that nutrition security is respected, protected, facilitated and provided to those it serves through the schools. The schools are therefore instructed to provide a "nutritious" meal daily, with the assistance of a nutritionist.

Ideally, Ghana School Feeding Program (GSFP) lunch should be able to provide a balanced diet with at least 33% of the nutritional requirements of the child. However, an inventory conducted by the Netherlands Development Organization in 2007 reported that the nutritional quality of the food was not balanced. A study conducted by Nnakwe (2013) also revealed that on average, the menus provided less than 30% of the Recommended Daily Intake (RDI) for nutrients such as protein, calcium, iron, thiamine, riboflavin and vitamin C. This has necessitated the need to evaluate the nutritional content of the GSFP as well as its impact on pupils' school attendance in the Birim Central Municipality.

2.1 Purpose of the Study

The purpose of the study was to evaluate the nutritional content of food served in the school feeding programme. Specifically, the purpose of the study was to determine the nutritional composition of the food served in basic schools participating in the school feeding programme and investigate if the nutritional composition of meals served to pupils meets their nutritional requirement for school lunches.

2.2 Research Questions

The study was based on the following research questions:

1) What is the nutritional composition of food served in the Birim Central Municipality by the School Feeding Programme caterers?
2) What is the level of knowledge of caterers on nutrition in the Birim Central Municipality the Birim Central Municipality?

3. Review of Related Literature

3.1 History of School Feeding

School feeding is a well-recognized programme that alleviates hunger while supporting education, health and community development. History has it that, school feeding initiatives originated as early as the late 1700's as the projects of charitable donors in Europe. However, concentrated school feeding interventions did not appear until the mid-1800s, as governments began incorporating school meals into their legislation. After World War II in 1945, the United States began the practice of initiating school feeding programmes in Austria as an act of international aid focused on combating the severe malnutrition of children. Since that time, school feeding programmes have become a key part of food assistance and relief in emergency and development programmes (Nnakwe, 2013).

Additionally, the presence of a school feeding programme has been shown to improve the lives of children and families by reducing financial burdens on families who must often decide between having children work and sending the children to school. In addition, by addressing the nutritional needs of these children, school feeding programmes enhance the child's ability to focus on their education, leading to higher lifetime earnings and benefiting the child, family and greater community (Boston Consulting Group, 2009).

According to Richter, Griesel and Rose (2000), school feeding has its origin in the 1930s, when schemes were introduced in the United Kingdom (UK) and the United States (US) with the explicit aim of improving the growth of children. In the United Kingdom, a programme that subsidized milk for school children was initiated in 1934 and milk was provided free from 1944 onwards (Baker, Elwood, Hughes, Jones & Sweetnam, 1978). In the late 1960s and early 1970s, this benefit was withdrawn from all, except for those children considered to be particularly needy (an early example of the targeting approach in school feeding). School feeding was soon introduced to South Africa, which started a programme to supply free milk to white and coloured schools in the early 1940s. Since then, school feeding has broadened to include the provision of fortified biscuits, nutrient supplementation or full meals.

3.2 Objectives of School Feeding Programme

Conceptually, Bennett, Crawford and Cartwright (2003) argue that one of the main difficulties with SFPs has been the mixing of objectives by proponents of school feeding. So, for instance, a SFP will be initiated in order to ensure that children are better able to concentrate at school, but the food provided might be in the form of a take-home ration, or might only be provided late in the school day, so it does not benefit learners in the classroom. In view of this, the objectives of school feeding vary depending on the context. However, the general objectives of school feeding are to:

- meet the immediate food needs of children;
- alleviate short-term hunger and improve learning capacity;

- increase access to education (i.e., enrolment, attendance, retention and completion);
- reduce gender and social inequalities;
- improve the health and nutrition status of the children;
- increase development opportunities of the children.

3.3 Nutritional Needs of Targeted Group

Nutritional status is a powerful influence on a child's learning and on how well a child performs in school. As indicated by available data. Children who lack certain nutrients, particularly iron and iodine in their diet, or who suffer from protein-energy malnutrition, hunger, and other health-related diseases, do not have the same potential for learning as well-nourished and healthy children. According to Ahmed (2004), poor nutrition among school-age children diminishes their cognitive development either through physiological changes or by reducing their ability to participate in learning experiences or both. They also asserted that the extra demands on school-age children to perform household chores or walk long distances to school create a need for energy that is much greater than that of younger children.

It is estimated that 60 million school-age children suffer from iodine deficiency disorders and that another 85 million are at risk for acute respiratory disease and other infections because they are deficient in vitamin A. Jamison, Mosley, Measham and Bobadilla (1993) have stated that the number of school-age children who are suffering from iron deficiency anaemia is greater still (210 million). Poor nutrition and health among school children contribute to the inefficiency of the educational system. Children with diminished cognitive abilities and sensory impairments naturally perform less well and are more likely to repeat grades and drop out of school than children who are not impaired; they also enroll in school at a later age, if at all, and finish fewer years of schooling.

The irregular school attendance of malnourished and unhealthy children is one of the key factors in poor performance. In light of this, it is important for school-age children to meet at least 50% of the recommended intake levels of all essential vitamins and minerals as depicted in Table 1. According to Brown (2008), the provision of food for children during their six to seven hours of stay in school should meet at least 50% of the RDI of nutrients which is based on 2400 kilocalories. It is also important not to lose site of the fact that feeding children with nutritious meals yet keeping them hungry can have adverse effects as well. Pollitt (1994) is of the view that even temporary hunger, which is common in children who are not fed before going to school, can have an adverse effect on learning. As an experienced teacher and a nutritionist, I have observed that children who are hungry have more difficulty concentrating and performing complex tasks, even if otherwise well nourished.

Table 1: Recommended Dietary Intake of Nutrients

Nutrient	RDI for the day (100%)	RDI for lunch (50%)
Total fat	65g	32.5g
Protein	50g	25g
Carbohydrate	130g	65g
Fiber	25g	12.5g
Sodium	2400mg	1200mg
Potassium	3500mg	1750mg
Vitamin A	5000IU	2500IU
Calcium	1000mg	500mg
Iron	18mg	9mg
Iodine	150,ig	75^g
Phosphorus	1000mg	500mg
Magnesium	400mg	200mg
Manganese	2.0mg	1.0mg
Zinc	15mg	75mg

Source: Brown, 2007.

3.4 School Feeding Programme in Ghana

The school feeding programme in Ghana was initiated first in the 1950's by the Catholic Mission to supply the three northern regions of Ghana, namely the Upper East, the Upper West and the Northern regions with relief items to encourage enrolment, attendance and retention. WFP (2007) states that the Catholic Relief Service (CRS) was the first to initiate the free school meal for pupils in the 1950's. The rationales were to induce pupils into Catholic schools, enhance the nutritional content and promote enrolment, attendance and retention. Afoakwa (2012) states that Ghana's School Feeding Programme gained statutory backing in 2005. The Government of Ghana began to pilot the programme in all ten regions in the country. One school in each of the ten regions was selected to pilot the programme.

In September 2005, the GSFP began on a pilot basis with 10 schools from each region in the country. With about 64,775 pupils covered in 2006, the pilot phase came to an end, after which the first phase was rolled out in 2007 over a four-year period (2007-2010). The number of beneficiary pupils at the start of the first phase was 413,498. This number increased to 441,189 pupils in 2008. By 2009, the programme had covered 580,025 pupils. At the end of the 2009/10 academic year, beneficiary pupils had shot up to 697,416, indicating a steady increase over the period. The GSFP employs the in-school model of feeding and provides a meal for school children whenever they go to school. The school children are provided with lunch to minimize the need for them to leave the school to find food, lessen their hunger, boost their attention span and facilitate their learning. These meals are usually prepared in the school by caterers. The programme targets children in public kindergartens and primary (1-6) schools in the poorest regions of the country. Figures indicate that the GSFP feeds 1.6 million pupils country-wide (Afoakwa, 2012).

In fact, the programme was initiated in fulfillment of the AU-NPAD agreement of all the member states in relation to the UN-Millennium Challenge Goals charter which focuses on universal primary education to pupils in both rural and urban areas, gender equity and the promotion of girl-child education, especially in the rural areas in Ghana (Afoakwa, 2012). According to Abotsi (2013), the primary aim of the GNSFP was to provide free meals to school-going pupils to enhance enrolment, attendance and socio-economic development. Abotsi (2013) discusses that the Government of Ghana document with the heading "Coordinated Programme of Economic and Social Development Policies" revealed that the demand for basic primary education had improved, for which the free school meal served as one of the causal agents. As the primary level enrolment stands at 95.2% today as against 83.4% in 2008. To address pupil's absenteeism and dropout among Ghanaians, free meals are used as an effective incentive to induce school-going pupils to attend school and learn without any food-related difficulties, which obstruct learning among children (Abotsi, 2013).

The WFP (2007) indicates that within the rural areas and some selected urban centres where parents find it difficult to meet the three-square meals a day for their children. The programme has been initiated to cushion the families and to enhance the children's schooling. The disadvantaged children and families are the people that benefit most from the programme in Ghana. School feeding is an effective tool to overcome nutritional needs and food deficiencies.

At the start of the GSFP programme, menus were prepared for all the regions, based on local food variety and nutritional values. The menus were also based on the FAO's minimum nutritional requirements per child per day. In the northern regions, food items such as maize, beans, rice, gari, soya beans, cowpeas, fish, yams, meat, eggs, groundnuts, vegetables and fruits were considered on the menu. In southern Ghana, food items considered included maize, beans, rice, gari, groundnuts, palm fruits, plantains, yams, fish, meat, eggs, vegetables and fruits (Nnakwe, 2013).

The menu cost of 0.40 Ghana cedis (US$0.21) per child per day was chosen by the GSFP Secretariat based on local economic factors. There is no guideline on the quantities of ingredients to be used per child or the serving per child. Very few of the menus mention fruits and in the few instances where this is mentioned, the recommendation is to serve the fruit in season once or twice weekly. The Global Child Nutrition Foundation (Nnakwe, 2013) has reported that there are no nationally established nutrition guidelines for school feeding programme in Ghana. Schools are 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 (Nnakwe, 2013).

The thought that School Feeding Programme is supposed to reduce hunger and malnutrition among pupils on the programme and as a result improve the pupil's academic performance is very fragile. A study on the impact of the Ghana School feeding programme on the nutritional and health status of Ghanaian pupils in the Central Region by Van den Berg (2008) indicates that, although the school lunch significantly contributed

to the diet diversity among children at GSFP schools, no differences were found between the whole day food consumption of GSFP children as compared to non-SFP children. Also, the study did not show that the nutritional and health status of the children in the Ghana SFP schools improved by serving them one hot meal every school day.

The school feeding programme is supposed to lead to an increase in school attendance and retention, attentiveness in class and thus enhance the pupils' participation in the teaching and learning process. This is expected to have a positive impact on the children's academic performance. GSFP tends to alleviate immediate short-term hunger and this is expected to increase pupil attentiveness in class. Children who are not hungry are expected to have more attentive and have higher cognitive abilities. Short-term hunger can adversely affect the attention and interest of a pupil (Levitsky, 2005). Therefore, school attendance and retention, attentiveness in class and enhancement of pupils' participation in the teaching and learning processes lend credence to the expectation of improvement in academic performance. According to Adams and Hayes (2001), academic performance really means three things: (a) The ability to study and remember facts, (b) being able to study effectively and see how facts fit together to form larger patterns of knowledge and being able to think for yourself in relation to facts and (c) being able to communicate your knowledge verbally or down on paper.

The GSFP can thus be said to be a laudable programme in promoting education for all in all aspects since its target is not only quantity but quality as well. Ghana's Poverty Reduction Strategies (GPRS) paper named the capitation grant and the school feeding programme as strategies for meeting the quality needs of basic education. It is based on this premise that the study seeks not only to find out whether the school feeding programme has had any positive impact on attendance and retention but also to evaluate the nutritional composition of the foods served in the Birim Central Municipality.

3.5 School Health and Nutrition

While school feeding interventions fall squarely within the scope of school health initiatives, programme addressing school health is much wider in scope than school feeding and may include de-worming, HIV and AIDS prevention and education, life and health skills education, and interventions aimed at reducing alcohol or drug consumption. Having said this, many school feeding programmes have significant health intervention components and are often an important platform from which to deliver health interventions such as de-worming and iodine supplementation. In low-income countries, poor health in the form of chronic protein-energy malnutrition, iron-deficiency anaemia, iodine deficiency or helminth infections, contribute significantly to poor educational outcomes.

Traditionally, health and education have been seen as separate domains (Child Health Unit, 1997), with consequent separation of responsibilities between government departments. Increasingly, however, the inextricable link between health and education is being acknowledged, and there is compelling evidence that shows how children's

education can benefit from broad health and nutrition interventions (Del Rosso, Miller & Marek, 1996).

3.6 Food Items Used in GSFP

Food items used in GSFP can be categorized into five basic food groups: (a) grains; (b) vegetables and fruit; (c) meat, fish, and beans; (d) starchy roots and plantain and (e) milk. Each food group contains a certain nutrient that enhances both the cognitive and physical growth of school-age children.

a. Grains

Grains contain carbohydrates, fiber, and some vitamins and minerals. The most notable benefit of eating plenty of grains is the amount of fiber one gets. A diet that includes plenty of fiber can reduce the risk of constipation, heart disease and diabetes. Grain food items used in GSFP include rice, maize, millet, sorghum and wheat (Ahmed, 2004).

b. Vegetables and Fruits

Vegetables and fruits provide vitamins, minerals, and carbohydrates. In general, they promote overall good health. Fresh, canned, dried and frozen fruits each supply a wealth of vitamins and minerals, most notably vitamin C and potassium. Vitamin C is an antioxidant that helps control infections and aids the body in producing collagen, a substance necessary for healthy bones, teeth and blood vessels. This vitamin also helps neutralize free radicals, which can decrease one's risk of certain illnesses and diseases. All the vegetables supply nutrients and the more colourful they are the higher the concentration of key vitamins and minerals, such as vitamin A and folate. Vitamin A is crucial for the health of one's eyes, and also encourages the body to produce healthy white blood cells. Additionally, it helps the body to maintain bone mass and aids in the health of the skin. Many vegetables, most notably leafy greens, also provide folate, a B vitamin that helps reduce the risk of certain birth defects, such as spina bifida. Vegetables like broccoli, spinach, and carrots provide vitamins A and C, folate, iron and magnesium. They also have high fibre content (Ahmed, 2004).

c. Protein Foods

Protein foods are also a healthy source of iron, a mineral that is crucial for the formation of healthy red blood cells and for the movement of oxygen through the body. Zinc is another mineral present in many protein foods. This mineral supports a healthy immune system and aids in wound healing and cell division. Foods in the meat, fish, and beans group supply protein, B vitamins, iron, and zinc. They are primarily responsible for building and repairing muscles and tissues, digesting nutrients, and improving immunity and blood quality. Meat, beans, nuts, seeds and tofu, each supply a healthy dose of protein. The body relies on protein for each of the functions it carries out and to produce energy from the foods we eat (Ahmed, 2004).

d. Starchy Roots and Plantain

Foods in this group include yam, cassava, cocoyam, taro, potatoes and plantain. This group contains water, carbohydrate, fat, fiber, calcium, carotene, vitamins B_1 and B_2, niacin, ascorbic acid, folic acid and iron. With the exception of water which makes up 70% of this group, there are very little of other nutrients. However, they form the bulk of most meals in Ghana.

e. Dairy

Dairy foods are usually associated with calcium, a mineral essential for strong teeth and bones. Dairy foods, such as milk, cheese and yoghurt, are healthy sources of phosphorus. Phosphorus works with calcium to support healthy bones and teeth and also helps to maintain a regular heartbeat and contract the muscles properly. Milk supplies a good amount of vitamin D which helps the body to absorb calcium. It also supports a healthy immune system. They also supply protein, riboflavin, and vitamins A and D (if fortified) (Ahmed, 2004).

3.7 Nutritional Content of GSFP Meals

Meals that individuals eat are composed of different chemical substances that give each ingredient their flavor, colour, texture, reaction to temperature and digestion mechanism. Also, chemical substances in food items are utilized by the body to assist the body to function correctly and stay healthy. Meals served by GSFP contain different nutrients and each has its own function in the body. It is worth mentioning that each nutrient is vital to life and consequently, the health of an individual will suffer if any one of the nutrients is in short supply. There are five main groups of nutrients; protein, fat, carbohydrate, vitamins and minerals. However, water can also be called a nutrient as it is vital to life. According to Ahmed (2004), each nutrient has several chemical compositions.

A. Proteins

According to Addo, Adipa, Adu, Amenuke, Amoakohene, Olu, Baffoe, Forster, Tsorgali and Watson (2008), protein is a vital nutrient for the growth, repair, and maintenance of the body as the body is composed of millions of cells which are constantly being replaced and repaired. Protein foods are found in animal foods such as meat, milk, cheese, fish, and eggs; and plant foods in the form of cereals, pulses and some vegetables. Lack of protein results in a deficiency disease called kwashiorkor (a disease characterized by protruding belly, swollen feet, drooping cheeks, scanty and thin red hair).

B. Carbohydrate

This source of nutrients provides the body with energy. Due to the fact that protein also provides the body with energy once it has been used for its main function of growth and repair, carbohydrates should be used in preference to protein as an energy supplier. Starchy roots and tubers such as potatoes, yam, and cocoyam are usually eaten together with protein foods. Lack of carbohydrate nutrient result in deficiency disease such as

marasmus which is characterized by a thin body, and general weakness (Addo *et. al*., 2008)

C. Fats

Fats provide a convenient and concentrated source of energy. According to Addo *et. al.* (2008), fats supply more energy than the same weight of carbohydrates or protein. Also, it surrounds and protects certain vital organs like kidneys and glands. Fats form an insulating layer beneath the skin to help preserve body heat and offer protection to the skeleton and organs. Sources of fat are animal products (meat, dairy produce and fish), and plants (seeds, nuts and pulses, kernels and fruits). The deficiency of fat nutrients results in general body weakness.

D. Vitamins

Vitamins are nutrients that are required by the body in a small amount. The body needs vitamins to regulate and maintain its growth. A diet lacking in one or more vitamins will result in specific deficiency diseases such as night blindness, rickets, delay in the clotting of blood and excessive bleeding during injuries, pellagra, scurvy, beri-beri and general body weakness (Addo *et al*., 2008).

E. Minerals

There are many elements that form part of this nutrient (Addo *et. al*., 2008). The example includes calcium, iron, phosphorus, potassium, sulphur, chlorine, iodine, manganese and zinc. These elements are required for bodybuilding, control of body processes and essential parts of body fluids. Sources of mineral nutrients are milk, cheese, liver, kidney, fish, iodized salt and green vegetables (Addo *et al*., 2008). Anaemia, poor skeleton formation and goitre are diseases associated with mineral deficiency.

Limited studies have tried to analyse the nutritional content of the meals given as part of the GSPF. One of the studies that looked at the nutrition content of the GSFP meals was conducted in 4 primary schools in 4 districts in the Central region (Nnakwe, 2013). Although this study is limited to a very small location, it provides vital information on the nutritional content of the meals. According to Nnakwe (2013), on the whole, the average school meal provides 37.0% of the energy requirement of a moderately physically active child in a day. Protein intake from the meals was 73.9% of the weighted average of the recommended dietary intake for protein (33.3g/day). In terms of micronutrients, the nutrient adequacy ratio for vitamin A in an average school meal was 1.32 whilst that of iron is 0.28. This does not meet the WHO recommended standards. This revelation makes it expedient for the need to assess the nutritional knowledge base of caterers, who are awarded contracts for SFP.

3.8 Knowledge Base of Caterers on Nutrition for GSFP

Nutrition education which is provided by the various ministries in the country and various non-governmental organizations is an important method for developing a nutritionally informed population. Nutritional education according to Rosso (1999) is concerned with the lack of adequate nutrition information which serves as a major contributory factor to unwise food choices and food waste in the school lunch programmes brought about the Nutrition Education Programmes (NETP) in 1977. The NETP administered by the USDA, offered states grants to develop and implement a state nutrition education plan. In the legislation of NETP, the following were outlined as the need for the programme:

1) The proper nutrition of the nation's children is a matter of highest priority.
2) The lack of understanding of the principles of good nutrition and their relationship to health can contribute to a child's rejection of highly nutritious foods and consequent food waste in school food service operation
3) Many school food service personnel have not had adequate training in the fundamentals of nutrition or in how to motivate children to practice sound eating habits.
4) Parents and caregivers exert a significant influence on children in the development of nutritional habits hence; a lack of nutritional knowledge on the part of these people can have detrimental effects on children's nutritional development.

In Ghana, the Metropolitan, Municipal and District Assemblies (MMDAs) are responsible for interviewing and appointing caterers for the GSFP. The MMDAs are to ensure that appointed caterers are:

1) Capable of cooking food on a large-scale basis under hygienic conditions.
2) Able to demonstrate a basic understanding of the nutritional needs of children

Based on this, it can be assumed that appointed caterers know the kind of foods which make up each food group i.e., protein; dairy; grains; starchy roots and plantain; fats and oil. Again, it can be assumed that appointed caterers for GSFP know the amount of nutrients contained in each portion and therefore, the number of the portion(s) that should be served to a child to meet his or her nutritional needs.

4. Methodology

The research design adopted for this study was a descriptive survey design. A simple random sampling procedure was used to draw a sample of 4 schools out of 19 schools in Birim Central municipality. In all, there were 23 teachers, four head teachers and 15 cooks selected for the study. To obtain data that were relevant to the study, questionnaires, and food samples were used. The decision to use questionnaires to collect data for this study was based on the fact that the absence of personal interaction between me and the respondents would minimize my influence on the respondents and thus eliminate biases. The questionnaire items consisted of both open-ended and close-ended forms. I used both

forms since responses to close-ended forms might not provide adequate information. The open-ended form could also reveal more information than the close-ended form.

4.1 Laboratory Test of Food Samples

In order to determine the nutritional composition of food served under the school feeding programme, meal samples of food served were taken and kept in sterile containers and labelled. The samples were then carefully transported to the laboratory to determine their nutritional composition. Weights of both main dishes and accompaniments were recorded and based on the consistency of dishes, food samples were dried in order to achieve accurate results, and blended in a laboratory mortar and pestle before the actual chemical analysis. Because the reliability of the result was dependent on the accuracy of the chemical analysis performed on the food sample obtained, it was necessary to use a reputable laboratory that was well equipped. The food test/chemical analysis was carried out at the Agricultural Technology Village Laboratory of the University of Cape Coast.

4.2 Data Processing and Analysis

For research Question 1 which was intended to find out the nutritional composition of the food served in the Birim Central Municipality by the School Feeding Programme, nutrients were determined by conducting a chemical analysis of food samples at the Agriculture Technology Village of the University of Cape Coast. The full description of the chemical analysis process is as follows:

A. Gravimetric Determination of Moisture Content of the Food Served

Food samples that weighed 10g were dried in an oven at 105 ± 5°C for 24 hours and the moisture content was expressed as the percentage of moisture in the fresh sample upon determining the difference in weights between the fresh sample and dry matter.

B. Extraction of Soluble Sugars

The sugars were extracted from the various food samples using a modified method as proposed by Barreira, Ferreira, Oliveira, and Pereira, (2010). Approximately 10g of the homogenized samples were extracted with 40ml of 80% aqueous ethanol (Merck, SA) at 70°C for 30 minutes. After cooling to room temperature, the samples were centrifuged at 3000rpm for 15 minutes. The ethanol in the supernatant was evaporated and the extract was diluted to a final volume of 10 ml in pure water, filtered at 0.45p,m and injected for HPLC analysis.

C. Total Carbohydrate Determination

The total carbohydrate content of food samples was calculated using the following formula as described by Charrondiere and Burlingame (2004):

Total mass of carbohydrate (g) = 100 g - (moisture + protein + lipid + ash) grams.

D. Protein Content Determination

The Kjeldalh method was used to determine the protein content of food severed by GSFP. The amount of protein present was calculated from the nitrogen concentration of the food. Because the Kjeldalh method does not measure the protein content directly, a conversion factor of 6.25 which is equivalent to 0.16g nitrogen per gram of protein was then used to convert the measured nitrogen concentration to protein concentration.

E. Saponification and Extraction of Vitamins

With minor adaptations, the method proposed by Salo-Vaananen and Koivistoinen (2000) was applied to identify vitamin A and E contents of the homogenized samples. For saponification, samples of approximately 2g were weighed with a diet scale and put into flasks after which pyrogallol of 20 ml (15g.l-1, dissolved in absolute ethanol) and 10 ml KOH saponification solution were added. Taka diastase (0.01g) was added to digest starch and prevent the formation of lumps. The flasks were heated at 60°C for 30 minutes and cooled to room temperature for about 15 minutes. To avoid emulsion formation, 10 ml of 10% NaCl were added.

After saponification, the vitamins were extracted using three portions of 20 ml *n*-hexane-petroleum ether. With each portion, the flask was vortexed for about 30 seconds and centrifuged (4200rpm x 5 minutes). The phases were allowed to separate and the organic layers were washed with 20 ml of 5% NaCl and evaporated. Five millilitres of ethanol and 5ml of *n*-hexane were added to the flask and the solution was evaporated to dryness with nitrogen gas. The residue was dissolved in 1ml of *n*-hexane and filtered prior to analyses.

Exposure to high temperatures and a bright light was eliminated throughout the process to prevent the loss of vitamins.

F. Determination of Total Ash and Mineral Content

The total mineral content was determined by a dry ashing method during which the dried food samples were ashed at 525°C overnight in a muffle furnace. The resultant ash was determined gravimetrically while individual minerals (calcium, iron and zinc) were identified and quantified using inductively coupled plasma-optical emission spectrometry (ICP-OES) as per the method proposed by McCleary & Rossiter (2004).

Research Question 2 was aimed at finding out the level of knowledge of caterers on nutrition in the Birim Central Municipality. Items asked included the importance of nutrients to the body, types of local foods and the kind of nutrients they provide, and the constituents of a balanced diet. Responses from participants were analyzed using descriptive statistics of the Statistical Package and Service Solution (SPSS) for windows version 17.

5. Results and Discussion

5.1 Nutritional Composition of the Food Served in the Municipality by the SFP Caterers

Research question one sought to find out the nutritional composition of the food served in the various schools. First of all, a look is taken at the various meals served in the schools. The main dish consisted of beans stew, tomatoes sauce, okro stew, kontomire stew, and palmnut soup. The main dish was accompanied by staple foods like rice, gari, yam, banku or plantain. All the stews were made on the basis of oil (vegetable oil or palm oil), onion and tomatoes (fresh and/or tinned). It is worth noting that pupils were served with seasonal fruits such as orange, mango and banana as dessert once in a while. Table 2 shows an overview of the weekly meals consumed in the schools.

Table 2: Constituents of School Menus

School	Day	Main Dish	Accompaniment Dish
School A	Mon	Kontomire stew	Rice
	Tue	Beans/Ripe plantain	Gari
	Wed	Palm nut Soup	Yam
	Thu	Tomato sauce	Waakye
	Fri	Okro stew	Banku
School B	Mon	Beans/Ripe plantain	Gari
	Tue	Tomato sauce	Waakye
	Wed	Okro stew	Banku
	Thu	Palm nut Soup	Yam
	Fri	Kontomire stew	Rice
School C	Mon	Kontomire stew	Rice
	Tue	Beans/Ripe plantain	Gari
	Wed	Okro stew	Banku
	Thu	Tomato sauce	Waakye
	Fri	Palm nut Soup	Yam
School D	Mon	Kontomire stew	Rice
	Tue	Beans/Ripe plantain	Gari
	Wed	Okro stew	Banku
	Thu	Palm nut Soup	Yam
	Fri	Tomato sauce	Waakye

Source: Researcher's field data on menus of the selected schools.

The results obtained with regard to the nutrient composition of food served in the schools are presented in Table 5. The table shows that the average school lunch of school B recorded the highest energy intake of 1074.8 kcal which represents 44.4% of the Recommended Dietary Intake (RDI), followed by School C with an energy intake of 844.0 kcal, representing 35.1%; whereas school D and A recorded 684.2 kcal and 592.8 kcal which represents 28.5% and 24.7% energy intake respectively. According to Rosso (1999), the provision of food for children during their six to seven-hour stay in school should meet at least 50% of the RDI of nutrients which is based on 2400 kilocalories. Although

school B recorded the highest energy intake which is close enough to the 50% RDI (1200 kcal), it failed to meet the recommended 50%. This result indicates that none of the schools met the required energy intake for pupils.

Table 3: Mean Nutrient Intake of School Lunches

Nutrient	RDI (50%)	School A	School B	School C	School D
Energy (kcal)	1200	592.8	1074.8	844.0	684.2
Protein (g)	25	12.3	46.2	20.5	18.8
Fat (Energy %)	32.5	25.5	27.9	32.1	25.1
CHO (g)	150	97.3	127.4	113.7	106.9
Vitamin A(IU)	2500	598.6	1020.94.	968.5	573.9
Fiber (g)	12.5	0.9	2	3.0	1.8
Iron (mg)	9	2.3	10.1	6.8	5.1
Sodium (mg)	1200	86.2	200.3	116.4	89.5
Phosphorus (mg)	500	47.5	94	57.7	68.9
Calcium (mg)	500	86	122	109.6	94.2
Potassium (mg)	1750	93.7	182.6	173.3	93.7
Zinc (mg)	7.5	3.2	5.2	4.1	3.7

Source: Field Data.

With respect to the protein intake, School B was the only school which surprisingly exceeded the recommended 50% (25g) as it provided as much as 46.2g of protein. On the other hand, schools C and D were somehow close to the 50% RDI for protein. However, school A's average protein intake per pupil was woefully inadequate. It met only 12.3g (24.6%) of the required 25g (50%) of protein intake. Protein foods such as beans and fish are primarily responsible for building and repairing muscles and tissues as well as improving immunity and blood quality (Addo *et al.*, 2008). From the results, it is clear that apart from meals served to School B pupils, the remaining schools were not able to meet their protein requirement from meals served under the SFP.

The average content of fats in the school lunch was 32.1g/day for school C, 27.9g/day for school B, 25.5g/day for school A, and 25.1g/day for school D. Although none of the schools met the required 50% of the RDI which is 32.5g, school C was close enough to the recommended 50%. The carbohydrate content of meals provided by the schools surprisingly did not meet the recommended 50% (150g). Most often than not, it is assumed that Ghanaian dishes contain a high concentration of carbohydrates. However, starchy roots such as yam and cocoyam as well as plantain which are some of the main sources of carbohydrate in Ghana contains 70% water with very little other nutrients such as fat, fibre, calcium, carbohydrate, folic acid and iron. From Table 5, on average, the school lunch of a pupil from school B consumed 127.4g/d which represents 42.4% RDI for carbohydrate (CHO). School A provided the least carbohydrate intake of 97.3g which represents 32.4%.

Vitamin A content in the school meal was 20.4% (1020.9IU) for School B whereas that of School D was 11.4% (573.9IU). These figures constituted the highest and lowest

vitamin A intake, respectively. All vegetables such as kontomire, tomatoes, onion, and pepper contain minerals and vitamins such as vitamin A and folate. The food items that were responsible for 92.6% of the intake of vitamin A were palm oil and the aforementioned vegetables. The more colourful they are, the higher their concentration of key minerals and vitamins. Vitamin A is crucial for the health of one's eyes, and also encourages the body to produce healthy white blood cells (Addo *et. al*., 2008). Additionally, it helps the body to maintain bone mass and aids in the health of the skin (Ahmed, 2004). The results in Table 3 with respect to vitamin A intake from the schools imply that meals served to pupils under the SFP do not meet the 50% RDI for vitamin A which is 2,500IU.

The fibre content in the various school lunches did not meet the recommended 50% (12.5g). The fibre content was woefully low for all the schools to the extent that it did not even meet 25% (6.2g) RDI. School A had as low as 3.6% (0.9g) whilst school B which had the highest fibre content recorded 4.2g which represents 16.8%. Mineral elements such as calcium, potassium, phosphorus and sodium were so low and did not meet even 15% of their respective RDI. The low intake of these mineral elements especially calcium could result in diseases such as rickets in children. However, the content of iron and zinc which are also mineral elements was quite reasonable, even though the majority of the schools could not meet the required 50% RDI. The food items responsible for 90% of the iron intake were smoked fish, beans, maize dough, cassava dough, white rice, yam, tomato puree and raw fish.

The nutritional content of food served to children under the SFP is expected to help meet at least 50% of the RDI based on 2400 kilocalories. However, the protein was inadequate in the meals of three of the schools. Only one school met the 50% RDI for protein. Surprisingly the 50% RDI for carbohydrates, fats and oils, and minerals, required was not met by any of the schools. The closest attained was 42.4% RDI for carbohydrates. Vitamins which are essential for good eyesight, production of healthy blood cells, maintenance of bone mass, and health of the skin were woefully inadequate. The school lunch with the highest intake of vitamins, specifically vitamin A met only 20.4% RDI.

5.2 Level of Knowledge of Caterers on Nutrition

In Ghana, the Metropolitan, Municipal and District Assemblies (MMDAs) are responsible for interviewing and appointing caterers for the GSFP. The MMDAs are to ensure that appointed caterers are: (a) Capable of cooking food on a large-scale basis under hygienic conditions; and (b) Able to demonstrate a basic understanding of the nutritional needs of children. Based on this, the caterers were asked questions to ascertain their knowledge of nutrition and healthy eating.

They were asked to list foods that make a proper (balanced) diet. The foods listed were put in their various food groups such as proteins, carbohydrates, fats and oil, vitamins, and minerals. Water which forms the sixth group of nutrients for a balanced diet was, however, excluded. The results of the analysis of the responses are presented in Figure 3.

The figure shows the percentage of participants that were able to mention 2 food groups, 3 food groups, 4 food groups and all the 5 food groups.

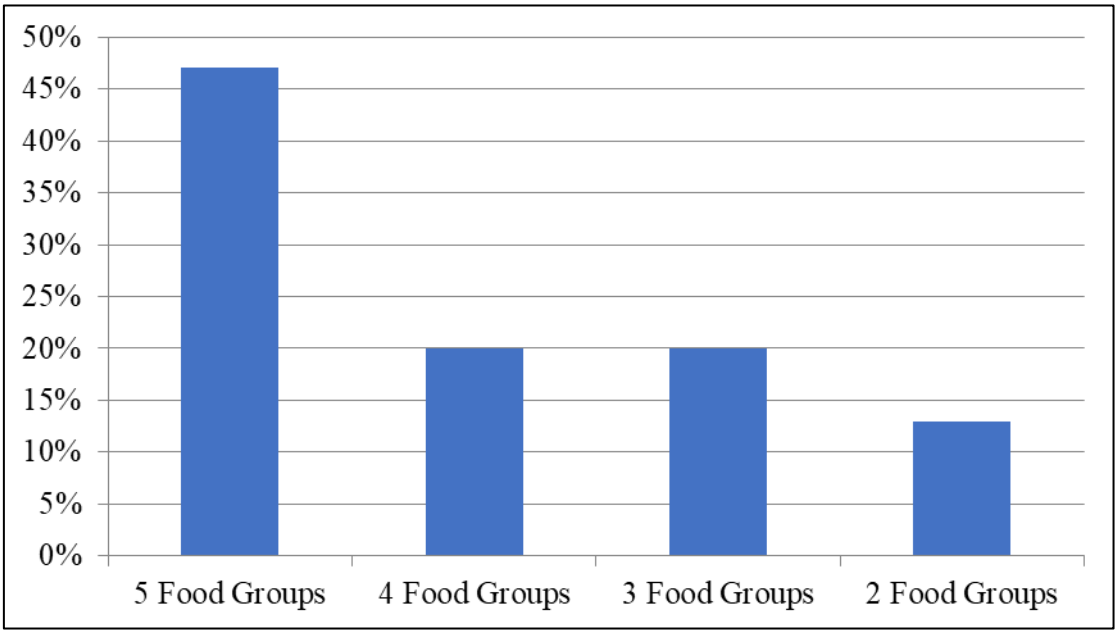

Figure 1: Responses on Foods that Make a Balanced Diet

From Figure 1, it can be observed that 47% of the participants were able to list foods that belonged to each of the food groups thus, including protein, carbohydrates, fats and oil, vitamin, and mineral. The same proportion of respondents, however, listed foods that belonged to four food groups (20%) and 3 food groups (20%). Only 13%, which constituted a minority of the respondents' listed foods that fell within only 2 groups.

From the results presented in Figure 1, the majority of the respondents were knowledgeable about foods that make up a balanced diet (vitamins, proteins, carbohydrates, fats and oil, and minerals). However, out of the six main nutrients excluding water, respondents knew much about carbohydrates, protein and vitamins whereas their knowledge of minerals and fats and oil was low. This probably accounts for why 53% of the participants could not list foods that belonged to each of the food groups.

The caterers were also asked about the importance of various groups of foods for the body. For maize, rice, sweet potatoes, cassava, sorghum, and millet, all the 15 (100%) caterers stated that each provides energy/strength. In response to what beans, meat, fish, eggs, soya beans, and milk do for the body, all the 15 (100%) indicated that they are for bodybuilding. With respect to the importance of tomatoes, onions, bananas, mangoes, pawpaw, and guavas, nine (60%) said they help fight diseases, and six (40%) said they give vitamins to the body. Responses that were given by participants on the importance of the various food groups were all accurate.

The importance of food was related to its known/perceived benefits to the body and as a result, the analysis of the responses indicated that all the respondents were of the view that foods such as maize, potatoes and cassava were commonly consumed as

they provided energy. All the respondents also agreed that beans, fish, milk, eggs and meat were important in bodybuilding. With respect to the importance of tomatoes, onion, bananas, mangoes, pawpaw, and guavas, the majority of the respondents said they helped in the prevention of disease and recovery from illness while the minority group simply said they provided vitamins to the body without necessarily indicating their importance. According to Addo et.al (2008), protein foods derived from plants and animals build up the body and also help to repair worn out-tissues; energy-giving foods which are derived from grains, cereals, starchy roots and tubers are very important as they provide the body with energy; fruits and vegetables are also very important as they protect the body against diseases. Participants' responses were all in line with Addo *et al*., (2008) stated the importance of the various protein, carbohydrate and vitamin foods.

The caterers were supposed to use local food stuff in the preparation of the meals, therefore, I wanted to find out caterers' knowledge of local food stuff and the type of nutrients they provide to the body. The results are presented in Figures 2, 3 and 4. These figures show the percentage of local food stuff which according to the respondents is rich in carbohydrates, protein and vitamins, respectively.

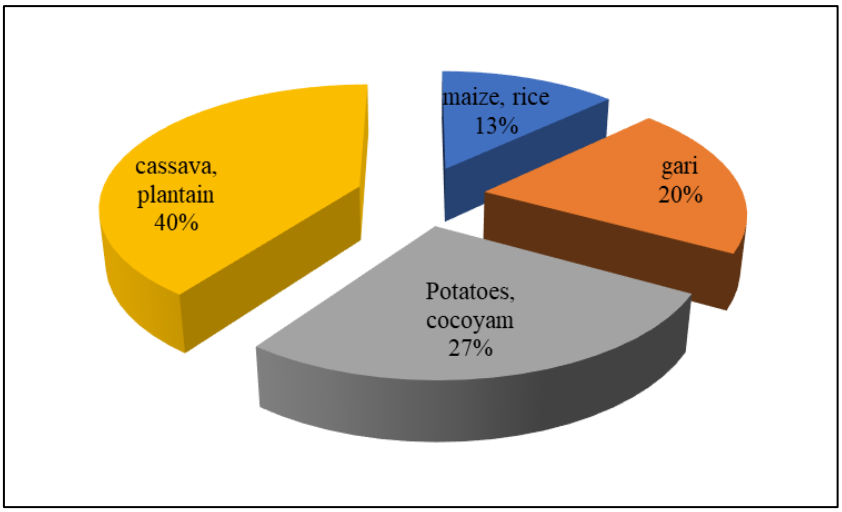

Figure 2: Local Foods Rich in Carbohydrates

From Figure 4, 40%, which represents the majority of the respondents, listed cassava and plantain as local food stuff that are rich in carbohydrates, followed by potatoes and cocoyam which recorded 27%. Twenty percent (20%) of the respondents listed Gari. Interestingly, 13% which represents a minority of the respondents' listed maize and rice as local foods that are rich in carbohydrates. In all, carbohydrate foods listed included cassava, plantain, potatoes, yam, gari, maize, and rice. From the results presented starchy roots and plantains recorded a higher percentage than grains and cereal. As indicated in the literature, starchy roots contain water, carbohydrate, fat, fibre, calcium, carotene, vitamins B1 and B2, niacin, ascorbic acid, folic acid and iron. With the exception of water which makes up 70% of this group, there are very little of other

nutrients. However, they form the bulk of most meals in Ghana. It is not surprising that the majority of the respondents mentioned this group as the source of carbohydrates.

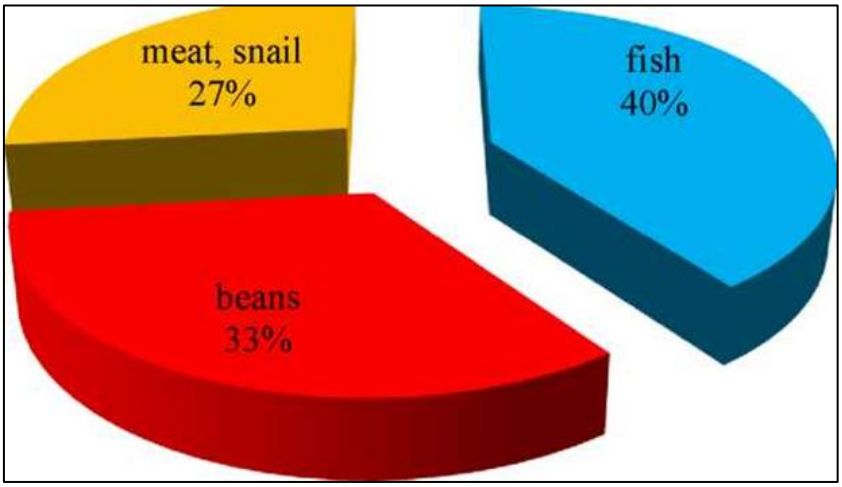

Figure 3: Local Foods Rich in Protein

With respect to local food stuff that is rich in protein, Figure 3 indicates that the majority of the respondents (40%) listed fish as a rich source of protein with beans following with 33%. A minority of the participants, however, listed snail and meat as rich sources of protein and this constitutes 27%. In all, protein foods that were listed included fish, meat, eggs, melon seeds (agushi), and groundnut. However, the results in Figure 3 indicate that meat and fish had a higher percentage as the source of protein than the rest confirming Addo *et al*. (2008) statement that, protein foods found mainly in animals are of high biological value (complete protein) and are often viewed by many as the major source of protein. Irrespective of this, foods listed under this nutrient supply B vitamins, iron, and zinc as well. They are primarily responsible for unity and blood quality. Meat, beans, nuts, and seeds, each supply a healthy dose of protein (Addo *et al.* 2008; Ahmed, 2004). The body relies on protein for each of the functions it carries out and to produce energy from the foods we eat.

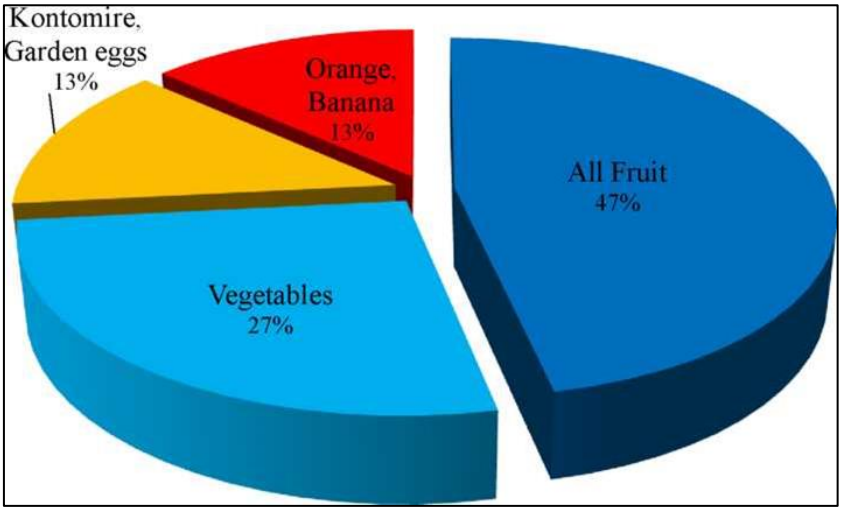

Figure 4: Local Foods Rich in Vitamins

With respect to vitamins (see Figure 4), the majority of the participants (47%) indicated all fruits as the source of vitamins, and 13% were of the view that bananas and oranges were the only sources of vitamins. Participants who listed vegetables constituted 40%. The results in Figure 4 depict that, most of the participants reported fruits as the only source of vitamins while the rest reported vegetables as the only source of vitamins. However, the literature review on the nutritional content of food items used in GSFP, revealed that both vegetables and fruits provide vitamins, as well as minerals, and carbohydrates (Ahmed, 2004). In general, they promote overall good health. Fresh, canned, dried and frozen fruits each supply a wealth of vitamins and minerals, most notably vitamin C which is an antioxidant that helps control infections and aids the body in producing collagen, a substance necessary for healthy bones, teeth and blood vessels. All vegetables provide nutrients and the more colourful they are, the higher the concentration of key vitamins and minerals, such as vitamin A and folate. Vitamin A is crucial for the health of one's eyes and also encourages the body to produce healthy white blood cells. Additionally, it helps the body to maintain bone mass and aids in the health of the skin.

Based on the results presented and discussed with respect to research question two, the level of knowledge of caterers on nutrition is adequate since their responses to the example of local food items that provided the body with carbohydrates, proteins and vitamins seem to be consistent with what was discussed in the literature under the nutritional content of local food items used in the GSFP. Caterers were also able to indicate how each food group was important to the body. The results also confirm that the MMDAs appoint caterers who are able to demonstrate a basic understanding of nutrition. It was also indicated in the literature that the lack of understanding of the nutritional content of food, principles of good nutrition and their relationship to health can contribute to a child's rejection of highly nutritious foods and consequently food waste in school food service operations. In light of this, caterers exhibited an understanding of the nutritional content of food, and principles of good nutrition as food wastage was not recorded in any of the schools.

6. Summary of the Findings

The nutritional content of food served to children under the SFP failed to meet at least 50% of the RDI based on 2400 kilocalories. The content of protein was inadequate in three of the schools with just only one, meeting the 50% RDI for protein. With respect to carbohydrates, fats and oils, and minerals, none of the schools met the 50% RDI. The school with the highest carbohydrate content met 42.4% RDI. In the case of vitamins, the school with the highest intake met only 20.4% RDI. This indicated that vitamins which are essential nutrients for the health of one's eyes, production of healthy blood cells, maintenance of bone mass, and health of the skin was woefully inadequate in the meals provided.

The nutritional knowledge of the caterers was quite good based on the fact that most of them knew the composition of a balanced diet (protein, carbohydrate, fats and oils, minerals and vitamins), the importance of the various food nutrients for the body with the exception of minerals, and fats and oils and the local foods that contain the various food nutrient.

7. Conclusions

The conclusions drawn from the findings about the nutritional content of food served in the SFP in the Birim Central Municipality are as follows:

1) The nutritional content of meals served to pupils under the SFP does not meet the 50% RDI for school lunches.
2) The knowledge base of caterers on nutrition was adequate. However, out of the five main nutrients (protein, carbohydrates, fats and oil, vitamins and minerals), their knowledge base on minerals and fats and oils was low.

8. Recommendations

1) Because the nutritional content of the meals provided by the SFP failed to meet the 50% RDI for school lunches, it is recommended that food commodities that have a high concentration of the various nutrient (protein, carbohydrate, fat and oil, vitamins and minerals) should be used instead of using those that have low concentration.
2) It was found that the nutritional knowledge of the caterers was quite good in terms of the composition of a balanced diet (protein, carbohydrate, fats and oils, minerals and vitamins). However, the importance of some food nutrients such as minerals, fats and oils as well as the local foods that contain the various food nutrients was lacking. It will be in the right direction if measures are put in place to educate caterers in this regard. This will help them to acquire in-depth knowledge on nutrition so that they will be able to provide nutritionally adequate meals for the pupils.

Conflict of Interest Statement

The authors declare no conflicts of interest.

About the Authors

Bernice Nana-Mireku is a teacher and Head of Department of the Home Economics Department at St. Francis Secondary Technical School, Akim Oda, Ghana. She holds MPHIL in Home Economics from the University of Cape Coast, Ghana. Her research interest is food and nutrition.

Charles Amoah Agyei is a lecturer at the Department of Integrated Science at the Akenten Appiah-Menka University of Skills Training and Entrepreneurial Development, Asante-Mampong, Ghana. He holds a PhD in science education from the University of Cape Coast. The author has published articles extensively in peer-reviewed journals and has research interest in context-based teaching, ethnographic research and science performance assessment.

Marvel Hinson is an assistant lecturer and a counsellor at the Cape Coast Technical University, Cape Coast, Ghana. She holds MPhil in Home Economics. Her research interest is food and nutrition.

Florence Harvey is a tutor at the Science Department at Methodist College of Education, Akim Oda, Ghana. She holds an MPhil in science education from the University of Education, Winneba, Ghana. She has been participating in supported teaching in schools and she is also involved in marking project work.

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