PJN
ISSN 1680-5194

PAKISTAN JOURNAL OF NUTRITION

ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorpjn@gmail.com

Pakistan Journal of Nutrition 9 (9): 844-852, 2010
ISSN 1680-5194

Orphanage Children in Ghana: Are Their Dietary Needs Met?

A. Sadik
Department of Hotel Catering and Institutional Management, Tamale Polytechnic,
P.O. Box 3, Education Ridge, Tamale, Ghana, West Africa

Abstract: Nourishing the body is a basic human right. The literature argued that children are born with the potential to develop both physically and emotionally. However, socioeconomic and environmental factors affect the health and nutrition of many children in developing countries. Little research has been done on the dietary needs of children living in orphanages in Ghana. The main objective of the study was to determine the nutritional status, food consumption patterns and dietary intake of the orphanage children. A non-experimental, descriptive action research with a multi-methodological approach was used. This study was conducted in an orphanage in Tamale. Forty children, 22 boys and 18 girls, aged 2-18 years and 23 orphanage workers formed the sample. Methods included on site observation, completion of a standard demographic questionnaire, a validated quantitative food frequency questionnaire and anthropometric measurements. The nutritional status indicated that, 10% and 15% of the children were severely stunted and wasted respectively (≤-2) Z score. The dietary intake data showed energy intakes for the children aged 1-3 years as 963 kcal, 7-10 years as 1627.4 kcal and 11-14 years as 1547.53 kcal and 15-18 years as 1540.6 kcal. Protein intake for the same age groups was 33, 52.1, 50.6 and 49.3 g respectively, with fat 27 g, 33.9 g, 31.9 g, 31.9 g and carbohydrate 150 g, 284.3 g, 269.1 g and 296.1 g respectively. The top five most frequently consumed foods were coffee (232 ml) and tea (232 ml), maize meal (109 g), bread (77 g), white rice (55 g). Protein was limited with anchovies ("Keta schoolboys") and beans as the only source. Orphanage children are vulnerable and disadvantaged members of the community, especially if measures to provide adequate dietary intakes in terms of macro-and micronutrient are not in place. The findings indicated low intake of both macro-and micronutrients with the exception of protein. Nutritional status indicated that, 10% and 15% of the children were severely stunted and wasted respectively (≤-2) Z score. The results of this study formed the basis for a nutrition education and training programme that was implemented in the orphanage.

Key words: Orphanage, nutritional status, food consumption patterns, dietary intake

INTRODUCTION

Adequate nutrition is a basic human right and embedded in the constitution of most developing countries (De Onis *et al*., 2002). Although nutrition is a basic human need it remains unmet for vast numbers of children, the latter who are thus unable to achieve their full genetic development potential, due to malnutrition (Rutengwe *et al*., 2001).

Poor nutritional intake has negative implication on children growth and immune-status leading to recurrent and increasing severe infectious illnesses and may ultimately threaten child's survival.

The ability to survive the first few years of life and the quality of that survival is a function of many environmental and social stresses that impinge upon the individual child, beginning during pregnancy and continuing through infancy and childhood (Kusin and Karjati, 1994). In the developed world over 97% of all children survive their pre-school years, whereas in many developing countries, 20-25% of children die before reaching their fifth birthday (Kusin and Karjati, 1994). Malnutrition is still widely prevalent among pre-school children in developing countries. The most devastating problem facing the majority of the world's poor and needy, is hunger and malnutrition, disease and poverty and these will continue to dominate the health conditions of the world's poor nations (Kusin and Karjati, 1994).

The consequences of malnutrition include death, disability, stunted physical growth and these, as a result, retard the national socio-economic development (WHO, 2000). According to the World Health Organization (WHO), (2000), 49% of 10 million deaths among children each year in the developing world, is associated with malnutrition. Henon (1998) states, that malnutrition in all its forms, exacts a heavy toll among children, in addition to causing the deaths of more than seven million children a year. It also impairs the development of millions of other young children throughout the world and continues to be an obstacle to human rights, quality and the dignity of life.

The World Summit for children held in New York during December 1990, represented by more than 150 governments, including 71 heads of states, formally endorsed the "…world declaration on survival, protection and development of children". The former president of

Ghana and his deputy were among the signatories. Among the series of goals adopted for the year 2000, was a one-third reduction in infantile deaths, halving child malnutrition, immunization levels of 90%, control of the major childhood diseases, eradication of polio, elimination of micronutrient deficiencies, halving the maternal mortality rate, primary school education for at least 80% of children, provision of clean water and safe sanitation for all communities and the universal ratification of the convention on the right of the child (Grant, 1996).

Incidences of malnutrition in Ghana orphanages are not clearly defined; due to the previous absence of national nutrition surveillance programme (GDHS, 2003). The only data available consist of a fragmented survey undertaken amongst some isolated groups (GDHS, 2003). Ghana lacks a national nutrition surveillance system; it was however recognized by the Nutrition Committee (1994), as a result of which a system was developed and implemented in clinics; these included monitoring the growth and well-being of children and giving special attention to vulnerable groups (GDHS, 2003).

Promoting children's health and nutrition in orphanages is, therefore, a priority and requires attention by all. Causes of death of children placed in orphanages are largely preventable and thousands of children can be saved if their nutritional needs are catered for (UNICEF, 1990a,b). The family has the responsibility of nurturing and protecting children from infancy to adolescence and children should be introduced to cultural values and norms of society and grow up in an environment and atmosphere of happiness, love and understanding so as to ensure them to have them to fully feel safe and develop their personalities. In this light, parents and caregivers need the support of institutions and society (UNICEF, 1990a,b).

This paper presents the findings of the study conducted in the orphanage. The objective of the study was two folds; the first part was to determine the nutritional status, food consumption and dietary intake of the orphanage children.

A need for this study was thus recognized by both the orphanage management and the researcher. An extensive literature study by synthesis, highlighting available scientific literature regarding the problem of malnutrition, the importance of the nutritional status of children and a food consumption pattern was done.

During an assessment of the food consumption patterns, kitchen facilities and staff skills that took place in October 2008 at the orphanage, the researcher identified the following problem areas:

- Insufficient funding for nutritional needs.
- Deficient knowledge of sound budgeting and cost control.
- Inappropriate methods of food procurement.
- No standardized food preparation methods.
- Absence of specific menu.
- Untrained caregivers in food service.
- Inadequate and absolute kitchen equipment.

MATERIALS AND METHODS

The planning of the empirical study included the development of questionnaires in order to determine nutritional status and food consumption patterns, recruitment, orientation and training of field workers.

Study design: A non-experimental, descriptive, action research was used. The study population consisted all 40 children, 22 boys and 18 girls aged 2-18 years and 23 orphanage workers who were purposively sampled for the study and identification numbers randomly assigned to each child.

All the children were included and studied so as to determine their nutrition status and food consumption patterns, the orphanage workers who included 15 administrative staff and eight caregivers, provided information on food procurement, menu planning and children's feeding practices, food preparation and handling practices at the orphanage.

The study examined the nutritional status, food consumption patterns and dietary intakes of the orphanage children. Initial contacts were made with the management of the orphanage to approve the protocol of the study.

The study consisted of six phases that were systematically implemented. The phases are described as part of the conceptualization of the study design.

Ethical consideration: School of Applied Science Research Committee, Tamale Polytechnic approved the study. All key ethical issues were adhered to. Informed verbal consent was obtained from the management of the orphanage prior to the commencement of the study. Neither children nor workers of the orphanage, were paid to participate in the study, participation was voluntary.

Recruitment and orientation of field workers: Two field workers were recruited from volunteer staff members of the Department: Hotel, Catering and Institutional Management, to assist the researcher with the implementation of fieldwork. The field workers had formal qualifications in nutrition and food service management. Both field workers were Dagomba speaking and aged 25 and 35 years respectively.

The first step of the orientation training was to explain the objectives of the project and to equip field workers with the skills required to conduct the research. The training consisted of a two-day workshop to explain the process for conducting quantitative and qualitative research by the researcher. The researcher, in an

attempt to facilitate the understanding of the fieldwork, drew up a field-training manual for field workers. The emphasis was on ensuring that field workers knew and understood the objectives and importance of the study. The field workers furthermore received detailed instructions regarding anthropometric measurements and administering of all the other questionnaires to be used in the study, by means of practical sessions with volunteer subjects.

Study instrument

Demographic questionnaire: A standard demographic questionnaire collected personal data on the 40 orphanage children, it captured data on specific variables, including age, gender, health status, educational background, ethnicity, religion and activities performed. The demographic information gathered, was important to understanding the backgrounds of the orphanage children. The dates of birth for each child were recorded twice, first during the observational visit in October 2008 and again in January 2009 in order to make age examination as reliable as possible. The birth dates of the children aged two to five years were taken from clinic health cards provided by the caregivers. The children aged six to eighteen years, provided their birth dates from birth certificates.

Quantitative food frequency questionnaire: The validated QFFQ (Macintyre, 1998) was used in this study to obtain qualitative and descriptive information on food consumption patterns. The QFFQ consisted of two components, namely, a list of the foods and a set of frequency-of-consumption response categories. An extensive list of defined foods was included, with the aim of estimating total food intake and thus the dietary diversity. To verify food intake, all 40 children completed the QFFQ's in individual interviews, with the assistance of field workers. For children aged two to five years old, the caregivers helped to provide the information. Food models were used simultaneously to explain to the children portion sizes and the food items.

Pilot study: A pilot study to test and evaluate ease of completion, suitability, clarity and value of the measuring instruments was conducted on a random sample of 10 volunteers two weeks prior to the actual fieldwork.

A simple observational survey (Brink, 1999) constituted a situation analysis at the orphanage by means of a field visit in order to observe the orphanage's feeding practices, budgeting and cost control measures and other catering needs. The purpose of this phase was to conduct a situation analysis through observations at the orphanage. The field visit was carried out in October 2008.

Weight measurement: The field workers took repeated measurements of weight. The weight measurements were taken before breakfast from 07H00-08H00 so as to avoid diurnal variations (Hans de Ridder, 2002). Children under two years of age were suspended in a cloth sling on a MP 25 spring scale (Weighing Equipment Ltd (Limited), London) and weighed to the nearest 100 g (Gibson, 1990; Hans de Ridder, 2002; Lindskog *et al*., 1997; WHO, 1996).

A Philips electronic scale (Model 1122; Instron corp. (Corporation), Canton Mass United States America (USA) was used for weighing the children aged two to eighteen years. The scale was placed on an even floor. Children were weighed with light underclothes without shoes. Children stood upright in the middle of the scale, facing the field worker and looking straight ahead. They stood with feet flat and slightly apart until the measurement was recorded on the Personal Information questionnaire (Demographic questionnaire). The scale was calibrated to zero reading before each weighing session by the researcher. Body weight was recorded to the nearest 100 g (Lindskog *et al*., 1997; WHO, 1996), repeated and the average of the two measurements recorded.

Height measurement: The length of the children under two years of age was measured to the nearest 0.1 cm while they were in a recumbent position on a wooden platform, with a stadiometer sliding head board (Hans de Ridder, 2002; Lindskog *et al*., 1997; WHO, 1996).

A modified tape measure was used to measure the height of the children aged two to eighteen years. Height was measured, with the child facing the field worker, shoulders relaxed, buttocks and heels touching the wall. The child's arms were relaxed at the sides, legs straight and knees together and head in the Frankfort's plane (Gibson, 1990; Hans de Ridder, 2002). Each child's height was taken barefooted. A direct reading of height was recorded to the nearest five millimeters (mm) and then repeated and the average of the two measurements recorded (SAVACG, 1995).

Anthropometric measurements: Anthropometric data, namely, weight-for-age, height-for-age, (Body mass index) BMI-for-age and weight-for-height were taken.

Data capturing and analysis: Data was captured and analyzed by means of a Personal Computer (PC) with Microsoft Windows 2007® software. All field-collected data were entered into appropriate computer software for statistical analysis. The details of each procedure followed to treat the data, are reported.

During April to June, the collected data of the three questionnaires were processed. The results of these questionnaires guided the researcher to plan and adjust the intervention programme that was implemented in the second part.

The demographic data were collected and captured on a Microsoft Excel® spreadsheet. The information was

then converted into the Statistical Package for Social Studies (SPSS, version 10.1).

Food consumption patterns and nutrient intake data were captured from the QFFQ and analyzed by using the software programme, Dietary Manager® 2000. The programme computed the means and standard deviations of the daily nutrient intake and the top 20 frequently consumed foods.

The anthropometric information from the Microsoft Excel® spreadsheet was then converted into the Statistical Package for Social Sciences (SPSS®, version 10.1). Descriptive statistics such as means, standard deviations and Z-scores, were calculated. The Z-scores of the children were then compared to the existing National Centre for Health Statistics (NCHS) reference values (WHO, 2000) and the Nutrition Canada National Survey, Nutrition Canada 1980, as reported by Gibson (1990).

RESULTS AND DISCUSSION

Demographic information: The data in Table 1 show the age distribution of the children. The age of the children varied between two and eighteen years old.

Home language of children: The results summarized in Table 2, indicate that three languages were mainly spoken in the Village, with the majority (67.5%) speaking Dagbani, followed by children speaking mamprushi (27.5%) and Gonja (5%).

Religion, education and health status of children: All the children (n = 40) were Moslem and attended school. One-to-three-year-old children 12.5% attended a crèche and those of seven to eighteen years (87.5%) were in different grades, ranging from primary one to Junior High School. None of the children suffered from any chronic or infectious diseases and none was allergic or had any known food intolerance or was on special diet. None of the children was on medication or a vitamin supplement.

Sports and leisure activities performed by the children: The data in Table 3 indicate, that 100% of children watched television daily, 50% received physical training at school, 35% engaged in school sporting activities and 28% performed indoor games, for example draughts and playing-cards.

Table 4, 5, 6 are a combination of both sexes and ages; this is in accordance to the (WHO, 1995b).

Table 4 indicates that 85% (n = 34) of the children in the Tamale children Village, have a normal weight-for-age (>-2 <+2) Z-score, 10% were underweight on the (≤-2) Z-score and only 5% had weight-for-age above the (≥+2) Z-score.

Data in Table 5 show that 77.5% were of the normal height-for-age (> -2< +2) Z-score, 10% were probably severely stunted height-for-age on the (≤-2) Z-score and 5% were nourished according to the (≥+2) Z-score.

Anthropometric indices data were calculated by using SPSS® and compared, with National Health and

Table 1: Age distribution of the children

	Male		Female		Both genders	
Age range in years	Number	%	Number	%	Number	%
1-3	2	5.0	3	7.5	5	12.5
7-10	4	10.0	3	7.5	7	17.5
11-14	9	22.5	8	20.0	17	42.5
15-18	7	17.5	4	10.0	11	27.5
Total	22	55.0	18	45.0	40	100.0

Table 2: Home language of the children

	Male		Female		Both genders	
Home language	Number	%	Number	%	Number	%
Dagbani	16	40	11	27.5	27	67.5
Mamprushi	6	15	5	12.5	11	27.5
Gonja	0	0	2	5.0	2	5.0
Total	22	55	18	45.0	40	100.0

Table 3: Sports and leisure activities performed by the children

	Male		Female		Both genders	
Sports and leisure activities	Number	%	Number	%	Number	%
Physical training	18	45	2	5	20	50
Running/jogging	10	25	0	0	10	25
Indoor games	12	30	16	40	28	28
Football	20	50	0	0	20	20
Watching television	22	55	18	45	40	100
School sports	10	25	4	10	14	35
Others; specify	0	0	0	0	0	0

Table 4: Z-score distribution of weight-for-age for Tamale children home (n = 40)

	Parameter		
Z-score	Percentiles	Number	Percentage (%)
≤-2	<5%	4	10
>-2<+2	5%-95%	34	85
≥+2	>95%	2	5
Total		40	100

Table 5: Z-score distribution of height-for-age for Tamale children home (n = 40)

	Parameter		
Z-score	Percentiles	Number	Percentage (%)
≤-2	<5%	4	10.0
>-2<+2	5%-95%	31	77.5
≥+2	>95%	2	5.0
Total		40	100.0

Table 6: Z-score distribution of BMI-for-age for Tamale children home children (n = 40)

	Parameter		
Z-score	Percentiles	Number	Percentage (%)
≤-2	<5%	6	15
>-2<+2	5%-95%	32	80
≥+2	>95%	2	5
Total		40	100

Nutrition Examination survey (National Centre for Health Statistics, WHO, 2002) reference Z-score.

Data in Table 6 indicate that 80% were of normal BMI-for-age and 15% were severely wasted (≤-2) Z-score. The data further suggest that probably 5% were at risk of overweight. These interpretations indicate that although the dietary pattern of the children was not good, the children were possibly not malnourished. The Z-scores on their own, do not give a full clinical picture and although in theory, it can be said a Z-score of -0.5, is within the normal range; the individual may have clinical signs, suggesting that they are worse than they appear (Ojo *et al*., 2000).

Food consumption and dietary intakes of the orphanage

Macro- and micronutrient intakes of children: A combination of dietary deficiencies mostly is the underlying cause of malnutrition, but acute infections may be a cause. Children are the population group mostly affected, therefore also needs most attention (FAO, 1998). Various interrelated factors are usually contributory to malnutrition, such as a marginal food supply as a result of rural poverty, income and rising prices, all at the expense of child care (Den Hartog *et al*., 1995). When improving diets, nutrition education should play a major role, but the actual practices, as well as the underlying economic and socio-cultural reasons, must be fully understood before attempts are made to modify feeding practices (Den Hartog *et al*., 1995). Children globally obtain their energy, macro-and micronutrients from a variety of sources. However, identifying these sources and comparing them to age groups, present difficulties, since food are sometimes classified in different ways (Jardine and Philpott, 1997). According to Lucas (2000) and Trahms (2000), children have very high energy and nutrient needs for normal body growth development and activity.

Findings of the nutrient intake, showed that mean levels of energy for the groups within the same age, were below the RDA whereas protein intake was higher than the RDA. Intake of fat and carbohydrates was low for all the age groups of, two to eighteen years. Although the children's total protein intake was sufficient, their energy intake was low.

In Ghana the deficiency of iron, vitamin A and iodine constitute a problem of major health concern. A study by Labadarios *et al*. (1999) reported that one out of two children had an intake of less than half of the recommendation for energy and a number of nutrients (calcium, iron, zinc, vitamins A, D, C and E); other nutrients were riboflavin, niacin and vitamin B_6). About 21.4% of pre-school children are anaemic and 33.3% of young children had a marginal vitamin A status (Ghana Demographic Health Survey, 2003). The results of this study showed that a low mean intake of micronutrients prevailed, including iron, zinc, calcium, niacin, riboflavin, thiamin, vitamin A and vitamin C, in all the age groups.

Vitamin D is needed for calcium absorption and for deposition of calcium in the bones. Because this nutrient is available from the action of sunlight on the subcutaneous tissue, the amount required from dietary sources, depends on non-dietary factors, such as geographical location and time spent outside, therefore children in Ghana may probably need no dietary vitamin D, which could be ascribed to adequate sunlight. Results of the present study indicated, that 85% of the orphanage children were engaged in outdoor games, which is a sign that children may not have a serious problem of vitamin D deficiency.

The inclusion of meat and dairy products, poultry, nuts, liver and green vegetables which are rich sources of vitamin B_1, B_2, B_3 and B_{12} in the eight-day cycle menu, will increase the intake, although sources of the vitamin B group were among the top 20 frequently consumed food items; the quantities consumed were too small. These results suggested that the children might probably be at risk of vitamin B complex, Iron Deficiency Anaemia (IDA) and Vitamin A Deficiency (VAD) before the intervention. A similar result by Dannhauser *et al*. (2000) showed that pre-school children younger than 72 months of age, had a low median intake of micronutrient.

This study also indicated, that intakes of calcium, magnesium, zinc, ascorbic acid, vitamin D and vitamin E, were below the RDA's. This implies that these

children might probably be at risk of developing micronutrient deficiency disorders. A possible reason for these low intakes could be that of poor food procurement, lack of a planned menu for the orphanage and inadequate nutrition knowledge of caregivers. Lucas (2000) suggested, that poorly planned menus could affect adequate nutritional intake. Frank and Klass (1996) indicated, that growth failure observed in institutionalized children, did not necessarily reflect an insufficient quantity and quality of available food, but rather too few caregivers to ensure that the available food was fed to those too young to feed themselves, a lack of tactical stimulation and care during the planning of meals for infants, children and adolescents.

These findings of nutrient intakes could probably suggest that the children were at higher risk of micronutrient deficiencies.

In general, the mean levels of daily energy intake were below the RDA, whereas protein intake was higher than the RDA for all the ages, except for the 15-18 years males, whose protein intake was below the RDA. Most of the micronutrient intake was below the RDA's for all age groups.

Results in Table 7 show, that the dietary intake of children aged one to three years old, was deficient for all nutrients, except for protein and magnesium.

The data in Table 8 show, that the dietary intake of children aged seven to ten years old, was deficient for all nutrients, except protein, when compared to RDA's.

The data in Table 9 show that with the exception of protein, iron and magnesium, the intake of all the other nutrients were below the RDA for the 11-14 year old groups.

The data in Table 10 show that, the dietary intake of children aged 15-18 years, was deficient for all nutrients, except for protein and zinc, however, the protein intake for females show an intake below the RDA.

Food consumption patterns: The data in Table 11 indicate, that the 20 most frequently consumed food items by weight, were coffee (232 ml), tea (232 ml), maize meal (109 g), brown bread (77 g), rice (55 g), rice porridge (50 g), white sugar (49 g), squash (28 g) and custard (17 g). The purchasing patterns confirmed that very little vegetable and fruit were bought. Protein was present in the top 20, but the average portion sizes were very small.

Procurement and preparation and could probably also be ascribed to care giver influence.

Major limitations of the study: Due to the limitation of available literature the greater part of the literature survey focused on the nutritional requirement of children aged two and eighteen years, as well as on nutrition education programmes.

Table 7: Mean daily macro- and micronutrient intake of children 1-3 years old (n = 5)

Nutrient	Mean	SD	RDA
Energy (kcal)	963	109	1300
Protein (g)	33	4.1	16
Fat (g)	27	5.0	
Carbohydrate (g)	150	32	
Fibre (g/day)	7	2.8	
Cholesterol (mg)	62	17.0	n/a
Added sugar (mg)	27	6.4	n/a
Micronutrients			
Calcium (mg/day)	112	25.2	500
Iron (mg)	4	1	10
Magnesium (mg/day)	126	38	80
Zinc (mg)	4	1	10
Vitamin A (ugRE)	237	61.3	400
Vitamin B_1 (mg/day)	0.4	0.1	0.5
Vitamin B_2 (mg/day)	0.1	0.3	0.5
Vitamin B_3 (mg/day)	2	0.2	8
Vitamin B_{12} (ug/day)	1	0.2	0.9
Vitamin D (ug/day)	0	0.2	5
Vitamin C (mg)	9	1.1	40
Vitamin E (mg)	4	1.09	6

RDA = Recommended Dietary Allowance

Table 8: Mean daily macro- and micronutrient intake of children 7-10 years old (n = 7)

Nutrient	Mean	SD	RDA
Energy (kcal)	1627.4	74	2000
Protein (g)	52.1	2.5	28
Fat (g)	33.9	3	
Carbohydrate (g)	284.3	22	
Fibre (g/day)	14.2	2	
Cholesterol (mg)	74.8	3.4	n/a
Added sugar (mg)	56.5	7	n/a
Micronutrient			
Calcium (mg/day)	167.8	12	1300
Iron (mg)	7.7	1	10
Magnesium (mg/day)	259.6	31.04	170
Zinc (mg)	7.2	1	10
Vitamin A (ug RE)	320.7	101.4	700
Vitamin B_1 (mg/day)	0.9	0.1	0.6-0.9
Vitamin B_2 (mg/day)	0.5	0.1	1.2
Vitamin B_3 (mg/day)	2	0.2	8
Vitamin B_{12} (ug/day)	0.1	0.1	4
Vitamin D (ug/day)	0.6	0.4	50
Vitamin C (mg)	10.5	3.2	45
Vitamin E (mg)	5.3	1	7

RDA = Recommended Dietary Allowance

Understanding was a problem when communicating with the caregivers, as they were dagomba's while the researcher is from Wa and could not communicate in dagomba. English was thus the language of communication.

The major findings of the study: The salient findings of the theoretical and empirical studies are summarized as follows:

Facilities and living conditions were good, but food preparation facilities were old, inadequate and neglected. Although hygiene was of a high standard,

Table 9: Mean daily macro- and micronutrient intake of children 11-14 years old (n = 17)

Nutrient	Mean	SD	RDA ♀	RDA ♂
Energy (kcal)	1547.53	207.04	2500	2200
Protein (g)	50.6	7.2	45	46
Fat (g)	31.9	2.5		
Carbohydrate (g)	269.1	43.2		
Fibre (g/day)	12.5	2.4		
Cholesterol (mg)	76.3	15	n/a	n/a
Added sugar (mg)	48.9	11.4	n/a	n/a
Micronutrient				
Calcium (mg/d)	163.2	21	1200	1200
Iron (mg)	7.4	1.1	12	12
Magnesium (mg)	241.9	37.01	240	240
Zinc (mg)	7.1	1.1	15	15
Vitamin A (ug RE)	300.1	78	1000	800
Vitamin B_1 (mg/d)	0.8	0.1	1.3	1.1
Vitamin B_2 (mg/d)	0.5	0.1	1.5	1.3
Vitamin B_3 (mg/day)	5	0.2	12-16	12-14
Vitamin B_{12} (ug/d)	1.1	0.2	5	5
Vitamin D (ug/d)	0.4	0.1	10	10
Vitamin C (mg)	9.7	2	50	50
Vitamin E (mg)	4.5	1	10	10

RDA = Recommended Dietary Allowance. ♀ Male ♂ Female

Table 10: Mean daily macro- and micronutrient intake of children 15-18 years old (n = 11)

Nutrient	Mean	SD	RDA ♀	RDA ♂
Energy (kcal)	1540.6	190.2	3000	2200
Protein (g)	49.3	7.3	59	44
Fat (g)	31.9	2.5		
Carbohydrate (g)	296.1	53.2		
Fibre (g/day)	12.5	2.4		
Cholesterol (mg)	75.3	11	n/a	n/a
Added sugar (mg)	54.1	13	n/a	n/a
Micronutrient				
Calcium (mg)	161.8	30	1200	1200
Iron (mg)	7.9	1.2	12	15
Magnesium (mg/d)	236.7	47.4	410	360
Zinc (mg)	6.9	1.2	15	12
Vitamin A (ug RE)	290.4	93	1000	800
Vitamin B_1 (mg/d)	0.8	0.1	1.5	1.1
Vitamin B_2 (mg/d)	0.5	0.1	1.8	1.3
Vitamin B_3 (mg/d)	6	0.2	16	14
Vitamin B_{12} (ug/d)	1.2	0.1	5	5
Vitamin D (ug/d)	0.5	0.4	5	5
Vitamin C (mg)	10.3	3	60	60
Vitamin E ($mg_{\alpha\text{-TE}}$)[d]	4.6	1	10	8

RDA = Recommended Dietary Allowance ♀ male ♂ female

caregivers had insufficient food preparation skills, proper food handling practices and limited understanding of nutrition.

Demographic data indicated the majority of the children in this study (70%) were adolescents. Adolescence is one of the most challenging periods in human development. Spear (2000) indicated that this is a period of sudden growth alteration, accompanied by an increase in nutritional needs. However, the adolescent has been considered nutritionally vulnerable for several reasons and these include: an increased demand for nutrients related to increase in physical growth and development and the change of life-style and food habits which affect both their nutrient intake and needs. The nutritional implications are that at this stage, the adolescent will try anything that will make him/her look better or improve the body image. This could probably be a contributing factor to the present state of nutritional status (Spear, 2000).

Table 11: Top twenty most frequently consumed foods

Rank	Food item	Mean±SD daily intake per 40 children (gram/ml)	Mean daily intake/child (gram/ml)
1	Coffee brewed instant	9288±232.2	232
2	Tea brewed	9288±232.2	232
3	Maize meal (TZ)	4376±37.1	109
4	Bread brown	3060±82.7	77
5	Rice, white cooked	2213±55.3	55
6	porridge	1963±49.1	50
7	Sugar, white granular	1643±20.5	49
8	Bra soup	1618±40.5	40
9	Cold drink fanta	1144±190.7	28
10	Custard, whole milk	667±16.7	17
11	fish, boiled	623±15.6	16
12	Maize, rice	607±26.4	15
13	Fish, smoked	575±15.1	14
14	Bread white	573±15.1	14
15	Beef on the bone	452±11.3	11
16	Beef, minced	432±10.8	10
17	Anchovies ("Keta school boys"	336±8.4	8.4
18	Peanut butter	281±7.2	7.03
19	spinach, cooked	271±7.5	7
20	Creamer, non-dairy	247±8.5	6.1

The results of the nutritional status of children indicated, that although the dietary patterns of the children were not good, the children were not malnourished 10% were probably severely stunted and 15% were severely wasted with cut-off points of (<-2) Z-score. This can be partly linked to the poor planning of menus and purchasing procedures found in the orphanage. The study demonstrated that some of these children in institutional care had poor growth and development. Otien *et al.* (1999) confirmed these findings in respect of institutionalized children.

Conclusion: There is a large gap in the knowledge of the nutritional status and requirements of the orphanage children. Children growing up in orphanage are most vulnerable and disadvantaged members of the community, especially if measures to provide adequate food intakes in terms of macro- and micronutrients are not in place.

The findings indicated low intake of both macro-and micronutrients with the exception of protein. Nutritional status indicated that, 10% and 15% of the children were severely stunted and wasted respectively (≤-2) Z score.

The results of this study formed the basis for a nutrition education and training programme that was implemented in the orphanage.

The establishment of the nutritional status of the children, the contributing factors and the application of appropriate interventions, were very important, taking into consideration the environment of the orphanage, the administrators, caregivers and backgrounds of the children. Furthermore, the interventions would need to focus more on the caregivers, since studies by Martin and Conklin (1999), Williams and Worthington-Roberts (1996) showed, that nutrition knowledge, motivation and behaviour could significantly improve the quality of children's health.

Recommendations: Based on the results of this study, the following recommendations of the orphanage children are drawn:

This study serves as a source of reference for local authorities in the Tamale in their attempt to fashion programmes to help raise the standard of living for orphanage in the north. Similarly, the authorities should take steps, so as to be able to strengthen their initiatives to alleviate poverty, which is a social menace, encouraging the establishment of orphanages.

The caregivers of the orphanage had no knowledge on the issues related to child nutrition. Since the nutritional needs of the children rely on the caregivers, it is essential that caregivers should be enlightened on how to make sound food choices to meet nutritional needs and food habits. Therefore a nutrition education and training programme was recommended.

The orphanage should establish links with qualified public health nutrition professional that can provide screening, referral and counseling for nutrition and health-related problems for both the children and caregivers.

In future, the management of the orphanage should encourage research to improve the conditions in the orphanage.

ACKNOWLEDGEMENT

The study was funded by the Department of Hotel Catering Institutional Management (HCIM) research budget.

REFERENCES

Brink, H.I., 1999. Fundamentals of research methodology for health care professionals. 2nd Edn., South Africa: Juta.

Dannhauser, A., C. Bester, G. Joubert, P. Badenhorst, M. Slabber, A. Badenhorst, T. Du Toit, H. Barnard, P. Botha and I. Nogabe, 2000. Nutritional status of pre-school children in informal settlement near Bloemfontein, South Africa. Public Health Nutr., 3: 303-12.

De Onis, M., C. Monteiro, J. Akré and G. Clugston, 2002. The worldwide magnitude of protein-energy malnutrition: An overview from the WHO global database on child growth. Bull. World Health Organisation, 71: 703-712.

Den Hartog, A.P., W.A. Van Staveren and I.D. Brouwer, 1995. Manual for social surveys on food habits and consumption in developing countries, Weikersheim Germany: Margraf Verlag publishers.

Food and Agriculture Organisation (FAO), 1998. Energy and protein requirements. Newsweek, 97: 47 December.

Frank, D.A. and P.E. Klass, 1996. Infants and young children in orphanages: One view from paediatrics and child psychiatry. Paediatrics, 97: 569 April.

Ghana Demographic and Health survey, 2003. Ghana Stistical Service Accra, Ghana. Noguchi Memorial Institute For Medical Research Legon, Ghana. ORC Macro Calverton, Maryland, USA.

Gibson, R.S., 1990. Principles of nutritional assessment. New York: Oxford University press.

Grant, J.P., 1996. Seeking a brighter future for children. New York, UNICEF. USA Today magazine, 124: 44 March.

Hans de Ridder, J., 2002. Anthropometric workshop 8th November 2002. (Accreditation-October 1998 in Adelaide, Australia).

Henon, P., 1998. Malnutrition: An unrecognised danger. The Courier, 16: 46 January-February.

Jardine, N. and C. Philpott, 1997. Children's nutrition: drivers for change. In: Glen Smith Children's food; Marketing and innovation. 1st Edn., United Kingdom: Chapman and Hall Suffolk.

Kusin, J.A. and S. Karjati, 1994. Maternal and child nutrition in Madura, Indonesia. Amsterdam: Royal Tropical Institute (KIT).

Labadarios, D., N. Steyn, E. Maunder, U. Macintyre, R. Swart, G. Gericke, J. Huskisson, A. Dannhauser, H. Voster and A.E. Nesamvumi, 1999. The national food consumption survey (NFCS): children aged 1-9 years. South Africa.

Lindskog, U., P. Lindskog and M. Gebre-medhin, 1997. Food and nutrition security: caring for women and children. Wageningen, The Netherlands: Margraf Verlag.

Lucas, B., 2000. Nutrition in children. In: Krause's food, nutrition and diet therapy 10th Edn., Philadelphia: W.B Saundres.

Macintyre, U.E., 1998. Dietary intake of Africans in transition in North West Province. Ph. D Thesis, Potchefstroom: PU for CHE. Republic of South Africa.

Martin, J. and M.T. Conklin, 1999. Managing child nutrition programmes: Leadership for excellence. Gauthersburg Maryland USA: Aspen.

Ojo, O., R. Deane and P. Amuna, 2000. The use of anthropometric and clinical parameters for early identification and categorization of nutritional risk in pre-school children in Benin City, Nigeria. The J. Royal Soc. Promotion Health, 120: 230-235.

Otien, P.A., R.W. Nduati, R.N. Musoke and A.O. Wasunna, 1999. Growth and development of abandoned babies in institutional care in Nairobi. East African Med. J., 76: 430-5 August.

Rutengwe, R., W. Oldewage-theron, R. Oniang and H.H. Vorster, 2001. Co-existence of over nutrition and under nutrition related diseases in low income, high-burden countries: a contribution towards the 17th IUNS congress of nutrition Vienna Austria 2001. Afr. J. Food Nutr. Sci., 1: 34-35.

Spear, B.A., 2000. Nutrition in adolescence. In: Krause's food and nutrition and diet therapy. 10th Edn., Philadelphia: W.B. Saundres.

The South African Vitamin A Consultative Group (SAVACG), 1995. Children aged 6-71 months in South Africa, 1994. Their anthropometric, vitamin A. iron and immunisation coverage status. Isando; SAVACG.

Trahms, C.M., 2000. Nutrition in infancy. In: Krause's food, nutrition and diet therapy. 10th Edn., Philadephia: W.B Saundres.

United Nations Children's Fund (UNICEF), 1990a. Children and development in 1990's, A UNICEF sourcebook. The World Summit for children. New York, 29-30 September.

United Nations Children's Fund (UNICEF), 1990b. First call for children. New York.

Williams, S.R. and B.S. Worthington-Roberts, 1996. Nutrition throughout the life cycle. 2nd Edn., St Louis Baltimore Boston Chicago: Mosby.

World Health Organisation (WHO), 1995. MDIS Working paper No 2. Global prevalence of Vitamin A deficiency. Switzerland: WHO utrition Unit.

World Health Organisation (WHO), 1996. Child malnutrition. Fact sheet No 119 (Reviewed) November 1996. [Available on internet] http://www.who.int/inf-fs/en/fact119.htm [Date of access: 15/11/02].

World Health Organisation, (WHO) Programme of Nutrition, 2000. Global database on child growth and malnutrition. [Available on internet] http://www.who.int/nutgrowthdb/intro_text.htm [Date of access: 15/11/02].

World Health Organisation 2002. The Worldwide magnitude of protein energy malnutrition:An overview from the WHO global database on child growth(available on the internet) http://www.who.int/whosis/cgrowth/bulletin.htm.Date of access; 15/11/2002.