PROXIMATE AND MINERALS QUALITIES OF MEALS SERVED AS LUNCH IN SELECTED PUBLIC AND PRIVATE PRIMARY SCHOOLS IN ILARO

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ABSTRACT

Hidden hunger is a form of malnutrition caused by a deficiency of vital micronutrients (vitamins, minerals and trace elements) in the body. These micronutrients are essential to the mental and physical development of both children and adults. This study evaluates the quality of meal served as school lunch in selected primary schools in Ilaro, Materials used for the collection of samples from the schools, are disposable plate with cover and sellotape. The meals were collected to determine the proximate and mineral contents of foods. The result of the proximate composition of school meal served in public school PUS day1 (Beans), PUS day2 (Rice and beans with fish) and PUS day3(white rice and vegetable soup and egg) revealed that moisture content of Bean, Rice and Bean + Fish and White Rice + Vegetable soup and Egg, ranged from (59.46 ± 3.56 to70.63±3.68), crude protein ranged from (10.11 ± 1.25 to 18.38± 1.89), carbohydrate (3.78±0.54to 8.80 ± 2.17), crude fiber (0.42±2.0.02 to 5.69 ± 0.25), crude fat (5.23±1.36 to 9.15 ± 1.35) ash content ranged from (1.06 ± 0.02 to 2.91±0.01) respectively. While that of Private school PRS day1 (Rice + spagh etti + meat) and PRS day2 (Jollof rice+fish) revealed that Moisture Content ranged from (64.35± 2.00 to 65.67±0.03) , Crude protein (9.06,± o.13to11.11 ±0.26), Carbohydrate(6.99,± 1.50 to 15.79 ±0.10), Crude Fiber (1.84,± 0.01 to 4.62 ±1.23), Crude Fat (6.36± 0.09 to11.12 ±0.58) and Ash Content ranged from (1.81,± 0.05 to 1.28 ± 0.01)S respectively. The result of mineral analysis of the school meal in private school (PRS day1 and day2) revealed that Vitamin A contents ranged from (88.56 ± 2.56 to 181.34 ± 3.66), Calcium (14.11 ± 1.53 to18.76 ± 1.62), Zinc (2.14 ± 005 t0 2.62± 0.07) and Iron (1.2± 0.01 to 1.62 ±0.01) respectively while that of Public school (PUS day1, day2 and day3) reveals that Vitamin A content ranged from(124.34 ± 2.88 to 211.86 ±4.06), Calcium (6.36 ± 1.20 to 12.81 ±1.50,) Zinc(1.16 ± 0.01 to 2.81 ± 0.09) and Iron (2.16 ± 0.05 to 12.12 ±1.50) respectively. The mineral content of meal served in both Public (PUS) and Private (PRS) Schools are very low in Vitamin A, and Calcium while the meal served in PUS day 1 to day 3 are high in zinc and iron respectively. However, most of the meal served in public is higher than that of Private School in micronutrients. In conclusion, the quality of meal served as school lunch in the selected primary school in Ilaro shown in this study were moderate sources of Protein, high Moisture Content, Fat and Zinc and low sources of essential macro and micro nutrients.

Keywords: Proximate, Minerals Qualities, School Meal.

INTRODUCTION

Malnutrition is a quiet widespread affecting millions of people throughout the world. Vulnerable populations, such as children, women (especially expectant mothers), the elderly and people suffering with a disability disproportionately suffer the effects of malnutrition. In addition, malnutrition exacerbates the cycle of poverty inherent in most under-developed countries. Many scholars recognize the relationship between malnutrition and poverty, in fact, the World Bank (2018) states that "Reducing malnutrition is central to reducing poverty". The complex nature of malnutrition makes defining the problem difficult. Throughout history, the definition of malnutrition has shifted focus from protein deficiencies (the Protein Gap) to a definition based on multiple micronutrient deficiencies. Schroeder (2013) scholars defined malnutrition as, protein-caloric malnutrition (PCM) and protein-energy malnutrition (PEM) (Allen, 2003, Bachou, 2002, Barrientos, 2011, &Olwedo, 2008). The United Nations advocated the effect of protein deficiency in 1955 by forming the Protein Advisory Group to promote the consumption of "new protein foods" Allen, L. H. (2003). Although protein deficiency remains significant, the most current definitions of malnutrition focus on the consumption of the proper amount of multiple micronutrients, such as Zinc, Iron, Iodine, Vitamin A, Folic Acid, and Selenium (Allen, 2003, Bachou, 2002, Barrientos, 2011, CDC & WFP, Lyons, GH et. al. 2004). While scholars agree that proteins as well as other micronutrients are important to overall nutrition, they disagree about the exact definition of malnutrition.

Some definitions focus on a lack of nutrient intake (Fanzo et al. 2010, Schroeder, D. G.2013), for example, "Malnutrition is the cellular imbalance between the supply of nutrient energy and the body's demand to ensure growth maintenance and specific functions" (Olwedo et al. 2008). Still others focus on infections, such as helminthic infections, as the defining characteristic of malnutrition (Francis, et. al. 2012, Francis, et. al. 2005, and Setboonsamg, 2002). Unfortunately, assessing the prevalence of infection and disease is beyond the scope of this design, which focuses primarily on nutrient consumption. This study uses the following definition of malnutrition**,** "Malnutrition is the syndrome of inadequate intake of protein, energy, and micronutrients, which result in poor growth and body size (Schroeder 2013)".

Apart from poor feeding practices and shortfalls in food intake, micronutrient deficiency is a direct cause of child morbidity and mortality. Micronutrients such as iron, iodine, vitamin A, are necessary for the healthy development of

children. Their absence in the diet cause serious disorders. For example, a lack of sufficient iodine can lead to goiter, hypothyroidism, mental and physical impairment. Damages due to iodine deficiency can be avoided by ensuring that the salt used in households is iodized.

In Nigeria, important progress has been made in Micronutrient deficiency control over the last years. Today Nigeria is justifiably considered Africa's success story on iodization of edible salt. It is the only sub-Saharan country to attain universal Salt iodization with about 97% of the households using iodized salt. This was confirmed by an external review carried out by the Global Network for Sustainable Elimination of Iodine Deficiency in 2005.

Vitamin A is essential micronutrient for the development of children's immune and visual systems. According to the Vitamin and Mineral Damage Assessment Report (2004), 25% of the Nigerian children are growing up with lower immunity, leading to frequent ill health and poor growth due to vitamin A deficiency. Only 27% of Nigerian children between 6 months and five years receive Vitamin A supplements routinely through health facilities although an average of 70 % received Vitamin A capsules during the National Immunization days.

CAUSES OF MALNUTRITION

An understanding of the causes and consequences of malnutrition is essential for formulating appropriate policies to improve nutrition as strategies need to be tailored to local conditions. For example, low food production caused by insufficient agricultural productivity is a primary reason for hunger in tropical Africa and remote parts of Asia and Latin America, whereas poverty is more likely the primary reason for hunger in South and East Asia, Latin America, Central Asia and the Middle East.

Past survey reveals that inadequate dietary intake is one of the main immediate causes of malnutrition, along with disease. The two interact in a vicious downward spiral. Inadequate food consumption heightens vulnerability to infectious diseases. In turn, infections, particularly malaria, measles, persistent diarrhea and pneumonia, can keep the body from absorbing adequate food (WHO, 1997). These immediate causes stem from a complex set of underlying causes at the household level: insufficient access to food – one aspect of food insecurity – poor maternal and child caring practices and inadequate access to clean drinking water, safe sanitation and health services. Ultimately, these factors are embedded in the larger political, economic, social and cultural environment in which households find themselves.

(Ahmed et al., 2007). Poor families cannot afford to purchase animal source foods that are rich in protein and Bio-available micronutrients (Black et al., 2008).

MACRONUTRIENT PRESENT IN FOOD THEIR FUNCTIONS

Foods provide energy and nutrients require for growth, body maintenance, reproduction and lactation. They also provide nourishment and protection from diseases. There are three macronutrients: carbohydrates, protein and fats, according to Smathers (2008) macronutrients are essential for proper body functioning, and the body requires large amounts of them. Macronutrients must be obtained through diet; the body cannot produce macronutrients on its own.

➢ CARBOHYDRATE

Carbohydrates are the sugars, starches and fibers found in fruits, grains, vegetables and milk products. Though often maligned in trendy diets, carbohydrates — one of the basic food groups are important to a healthy diet.Paige Smathers (2008). The American Diabetes Association notes that carbohydrates are the body's main source of energy. They are called carbohydrates because, at the chemical level, they contain carbon, hydrogen and oxygen.

➢ FUNCTION OF CARBOHYDRATES

Carbohydrates provide fuel for the central nervous system and energy for working muscles. They also prevent protein from being used as energy source and enable fat metabolism, according to Iowa State University USA (2008) "carbohydrates are important for brain function," Smathers (2008) said. They have influence on "mood, memory, etc., as well as a quick energy source." In fact, the Recommended Dietary Allowance (RDA) is based on the amount of carbohydrates the brain needs to function.

FIBER

Fiber is a type of carbohydrate that the body cannot digest. Though most carbohydrates are broken down into sugar molecules, fiber cannot be broken down into sugar molecules, and instead it passes through the body undigested. Fiber helps regulate the body's use of sugars, helping to keep hunger and blood sugar in check.

Children and adults need at least 20 to 30 grams of fiber per day for good health, but most Americans get only about 15 grams a day. Great sources are whole fruits and vegetables, whole grains, and beans.

➢ VARIETIES OF FIBER

- Soluble fiber, which dissolves in water, can help lower glucose levels as well as help lower blood cholesterol. Foods with soluble fiber include oatmeal, nuts, beans, lentils, apples and blueberries.

- Insoluble fiber, which does not dissolve in water, can help food move through one digestive system, promoting regularity and helping prevent constipation. Foods with insoluble fibers include wheat, whole wheat bread, whole grain couscous, brown rice, legumes, carrots, cucumbers and tomatoes.

The best sources of fiber are whole grain foods, fresh fruits and vegetables, legumes, and nuts.

Some tips for increasing fiber intake:

- Eat whole fruits instead of drinking fruit juices.
- Replace white rice, bread, and pasta with brown rice and whole grain products.
- For breakfast, choose cereals that have a whole grain as their first ingredient.
- Snack on raw vegetables instead of chips, crackers, or chocolate bars.

Substitute beans or legumes for meat two to three times per week in chili and soups.(Dietitians Association of Australia 2014)

➢ FUNCTION OF FIBER

Like adults, most children are not getting enough fiber. Fiber helps move food though the digestive tract, preventing constipation and abdominal pain. Fiber also helps us feel fuller longer, and hunger can be a distraction during the school day. Parents should work hard to feed their family nutritious, wholesome meals, but sometimes children need to try new foods several times before they like the taste. The key is to keep trying! Even if your child never learns to like kidney beans, there are plenty of other choice (Fiber and Prebiotics: 2013).

➢ FAT

Fat are an essential part of our diet and is important for good health. There are different types of fats, with some fats being healthier than others. To help make sure one stays healthy, it is important to eat unsaturated fats in small amounts as part of a balanced diet.

When eaten in large amounts, all fats, including healthy fats, can contribute to weight gain. Fat is higher in energy (kilojoules) than any other nutrient and so eating less fat overall is likely to help with weight loss.

Eating less saturated and trans fats may help lower your risk of heart disease. When buying products check the labels and choose the varieties that are lower in saturated and trans fats and higher in poly and monounsaturated fats. (Boukelif 2013). Eating greater amounts of saturated fat is linked with an increased risk of heart disease and high blood cholesterol levels. These fats are usually solid at room temperature and are found in Animal-based products

such as fatty cuts of beef, pork and lamb and chicken (especially chicken skin) and Dairy foods – such as butter, cream, full fat milk and cheese etc,

Unsaturated fats are an important part of a healthy diet, these fats help reduce the risk of heart disease and lower cholesterol levels among other health benefits when they replace saturated fats in the diet.

There are two main types of unsaturated fats:

Polyunsaturated fats: Omega-3 fats which are found in fish, especially oily fish and Omega-6 fats which are found in some oils such as safflower and soybean oil, along with some nuts, including brazil nuts.

Monounsaturated fats: found in olive and canola oil, avocados and some nuts, such as cashews and almonds.

TRANS FATS: are unsaturated fats that have been processed and as a result, behave like saturated fats. Eating Trans fats increases the levels of 'bad' cholesterol and decreases the levels of 'good' cholesterol in the body which is a major risk factor for heart disease. It is important to lower the amounts of trans fats one eats to help you stay healthy.

Trans fats are found in many packaged foods and also in butter and some margarines, it is great for health to replace saturated and trans fats with mono and polyunsaturated fats. Dietitians Association of Australia *(2014)*

PROTEIN: Protein is found throughout the body-in muscle, bone, skin, hair, and virtually every other body part or tissue. It makes up the enzymes that power many chemical reactions and the hemoglobin that carries oxygen in your blood. At least 10,000 different proteins make you what you are and keep you that way. (Philips S et al; 2006) Protein is made from twenty-plus basic building blocks called amino acids. our bodies make them in two different ways: either from scratch, or by modifying others. Nine amino acids—histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, and valine—known as the essential amino acids, must come from food. (Philips S et al; 2006).

FUNCTION OF PROTEIN

1. FOR GROWTH AND MAINTENANCE

Our body needs protein for growth and maintenance of tissues. Yet, one's body's proteins are in a constant state of turnover. Under normal circumstances, our body breaks down the same amount of protein that it uses to build and repair tissues. Other times, it breaks down more protein than it can create, thus increasing one's body's needs.

2. Causes Biochemical Reactions

Enzymes are proteins that aid the thousands of biochemical reactions that take place within and outside of one's cells: The structure of enzymes allows them to combine with other molecules inside the cell called substrates, which catalyze reactions that are essential to your metabolism.

Enzymes may also function outside the cell, such as digestive enzymes like lactase and sucrose, which help digest sugar. Some enzymes require other molecules, such as vitamins or minerals, for a reaction to take place.

Bodily functions that depend on enzymes includes digestion, energy production, blood clotting and muscle contraction

3. Acts as a Messenger

Some proteins are hormones, which are chemical messengers that aid communication between one's cells, tissues and organs. They are made and secreted by endocrine tissues or glands and then transported in your blood to their target tissues or organs where they bind to protein receptors on the cell surface.

Hormones can be grouped into three main categories:

- **Protein and peptides:** These are made from chains of amino acids, ranging from a few to several hundred.
- **Steroids:** These are made from the fat cholesterol. The sex hormones, testosterone and estrogen, are steroid-based.
- **Amines:** These are made from the individual amino acids' tryptophan or tyrosine, which help make hormones related to sleep and metabolism. Protein and polypeptides make up most of your body's hormones

RDA FOR MACRONUTRITIENTS DURING CHILDHOOD, AGES 9 TO 13 YEARS

CRUDE PROTEIN

The RDA for children ages 9 to 13 years is 34grams of protein per day. A child within this age range can meet this protein RDA by consuming 2 ounces of grilled chicken, 2 cups of lowfat milk. Other high protein foods include lean meats, eggs, seafood, nuts, seeds etc. American journal of clinical nutrition protein requirement of healthy school age children (2010).

CRUDE FAT

According to the institute of medicine, (2017), 9 to 13 years old should consume 25grams daily. The proper amount of fat supplies energy, helps the body to absorb certain vitamins. The majority of fats that a child eats should be monounsaturated and polyunsaturated fats, which includes omega-3 fatty acids. Healthy children. Org:(2012).

The RDA for carbohydrate is 130g per day.

MINERALS

Minerals are inorganic substances required by the body in small amounts for a variety of functions. These include the formation of bones and teeth; as essential constituents of body fluids and tissues; as components of enzyme systems and for normal nerve function.

Some minerals are needed in larger amounts than others, e.g. calcium, phosphorus, magnesium, sodium, potassium and chloride. Others are required in smaller quantities and are sometimes called trace minerals, e.g. iron, zinc, iodine, fluoride, selenium and copper. Despite being required in smaller amounts, trace minerals are no less important than other minerals.(Dietitians Association of Australia 2014*)*

Minerals are often absorbed more efficiently by the body if supplied in foods rather than as supplements. Also, a diet that is short in one mineral may well be low in others, and so the first step in dealing with this is to review and improve the diet as a whole. Eating a varied diet will help ensure an adequate supply of most minerals for healthy people.

The National Diet and Nutrition Surveys (NDNS) have revealed that some sub-groups of the population have low intakes of some other minerals, for example potassium, magnesium, zinc in men, and for women, iron, calcium, copper and iodine.

Most people do not show signs of deficiency but this does not mean their intakes or nutrient status are adequate. For example, adolescent girls, women of childbearing age and some vegans/ vegetarians are more susceptible to low iron status as their dietary intake may not match their requirements, and therefore they are at risk of iron deficiency anaemia. There is also concern about the calcium intake of some adolescents, and young and older women and the implications for future bone health. (U.K food magazine 2003)

- **FUNCTIONS OF MINERALS**

Major minerals		
Minerals	**Functions**	**Sources**
Calcium	Important for healthy bones and teeth; helps muscles relax and contract; important in nerve functioning, blood clotting, blood pressure regulation, immune system health	Milk and milk products; canned fish with bones (salmon, sardines); fortified tofu and fortified soy milk; greens (broccoli, mustard greens); legumes.
Iron	Part of a molecule (hemoglobin) found in red blood cells that carries oxygen in the body; needed for energy metabolism	Organ meats; red meats; fish; poultry; shellfish (especially clams); egg yolks; legumes; dried fruits; dark, leafy greens; iron-enriched breads and cereals; and fortified cereals.
Zinc	Part of many enzymes; needed for making protein and genetic material; has a function in taste perception, wound healing, normal fetal development, production of sperm, normal growth and sexual maturation, immune system health	Meats, fish, poultry, leavened whole grains, vegetables.
Iodine	Found in thyroid hormone, which helps regulate growth, development, and metabolism	Seafood, foods grown in iodine-rich soil, iodized salt, bread, dairy products.

- **VITAMINS**

Vitamins are substances that our body needs to grow and develop normally. There are thirteen vitamins our body needs. They are vitamin A, B vitamins (thiamine, riboflavin, niacin, pantothenic acid, biotin, vitamin B-6, vitamin B-12 and folate) ,Vitamin C, Vitamin D, Vitamin E and Vitamin K.

One can usually get all your vitamins from the foods one eats. The body can also make vitamins D and K. People who eat a vegetarian diet may need to take a vitamin B12 supplement.

Each vitamin has specific jobs. If one has low levels of certain vitamins, one may get health problems. For example, if one did not get enough vitamin C, one could become anemic. Some vitamins may help prevent medical problems. Vitamin A prevents night blindness.

The best way to get enough vitamins is to eat a balanced diet with a variety of foods. In some cases, one may need to take vitamin supplements. It's a good idea to ask your health care provider first. High doses of some vitamins can cause problems. (Philips S et al; 2006).

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- **FUNCTION OF VITAMIN**

Nutrient	**Function**	**Sources**
Vitamin A (and its precursor, beta-carotene). A precursor is converted by the body to the vitamin.	Needed for vision, healthy skin and mucous membranes, bone and tooth growth, immune system health	Vitamin A from animal sources (retinol): fortified milk, cheese, cream, butter, fortified margarine, eggs, liver Beta-carotene (from plant sources): Leafy, dark green vegetables; dark orange fruits (apricots, cantaloupe) and vegetables (carrots, winter squash, sweet potatoes, pumpkin)
Vitamin D	Needed for proper absorption of calcium; stored in bones	Egg yolks, liver, fatty fish, fortified milk, fortified margarine. When exposed to sunlight, the skin can make vitamin D.
Vitamin E	Antioxidant; protects cell walls	Polyunsaturated plant oils (soybean, corn, cottonseed, safflower); leafy green vegetables; wheat germ; whole-grain products; liver; egg yolks; nuts and seeds
Vitamin K	Needed for proper blood clotting	Leafy green vegetables such as kale, collard greens, and spinach; green vegetables such as broccoli,

		Brussels sprouts, and asparagus; also produced in intestinal tract by bacteria

MICRONUTRIENTS NEED FOR SCHOOL AGED CHILDREN

The period of childhood between ages 4 -13 years is characterized by continued physical growth and rapid cognitive, emotional, and social development lucas BL, et al (2008), wooldridge,(2002). Many children especially girls undergo their pubertal growth spurt between ages 4 and 13. This period of childhood precedes adolescence – the transition stage of development between childhood and adulthood. Due to increased growth and metabolism, the nutritional requirements of children are higher in proportion to body weight compared with adults, Food and Nutrition Board, (2001). Good nutrition throughout childhood is important not only to support normal growth and cognitive development but also to establish healthy eating patterns that are associated with decreased risk of chronic conditions and diseases in adulthood, including obesity, type 2 diabetes, cardiovascular disease, metabolic syndrome, and osteoporosis. Inadequate intake of nutrients can impair growth and development in children. This study discusses micronutrient (vitamins and nutritionally essential minerals) requirement of children ages 4 to 13 years. The Food and Nutrition Board (2001). of the institute of medicine establish dietary reference intakes (DRIs) for each micronutrient; these reference values should be used to plan and assess dietary intakes in healthy peop le.

RDA FOR MICRONUTRIENT DURING CHILDHOOD, AGES 9 TO 13 YEARS

Micronutrient	**Males**	**Females**
Vitamin A	600 µg/day (2,000IU/day)[c]	600 µg/day (2,000IU/day)[c]
Calcium	1,300 mg/day	1,300 mg/day
Iodine	120 µg/day	120 µg/day
Iron	8 mg/day	8 mg/day
Zinc	8 mg/day	8 mg/day

Food and Nutrition Board, (2001)

PREVENTION AND TREATMENT OF MICRONUTRIENT DEFICIENCY

Micronutrient requirements cannot be met through dietary intake alone, there are three additional key strategies which can be used to address deficiencies. These are supplementation, food fortification and bio fortification. Lissauer T et al; (2003).

- **Supplementation:** supplementation is the delivery of concentration micronutrients in pill, powder or liquid form.
- **Food fortification:** fortification is a subset of food processing and involves the addition of small amount of micronutrients to food products often commonly consumed by the general population (such as cereals, wheat flours and rice).
- **Bio fortification:** the use of agronomic and plant-breeding approaches in agriculture to increase the concentration of particular micronutrients in staple food crops. The most well-known example is so called "golden rice", which is rice grown with high concentrations of vitamin-A.

WHAT IS A SCHOOL?

A school is an educational institution designed to provide learning spaces and learning environments for the teaching of students (or "pupils") under the direction of teachers. Most countries have systems of formal education, which is commonly compulsory. In these systems, students' progress through a series of schools. The names for these schools vary by country but generally include primary school for young children and secondary school for teenagers who have completed primary education. An institution where higher education is taught, is commonly called a university college or university, but these higher education institutions are usually not compulsory.(Kenneth Hyltenstam 2015)

There are also non-government schools, called private schools. Private schools (Ganesh Harpavat 2006) may be required when the government does not supply adequate, or special education. Other private schools can also be religious, such as Christian schools, madrasa, hawzas (Shi'a schools), yeshivas (Jewish schools), and others.

SCHOOL LUNCH

Lunch, the abbreviation for luncheon, is a meal eaten around midday, Is commonly the second meal of the day, after breakfast. The meal varies in size depending on the culture. USDA (2015)

A school meal or school lunch (also known as hot lunch, a school dinner, or school lunch) is a meal provided to students and sometimes teachers at a school, typically in the middle or beginning of the school day. Countries around world offer various kinds of school meal programs. Each week day, millions of children from all standards and grades

receive meals at their respective schools. School meals provide high-energy food with high nutritional values either free or at economical rates (Aliyar, etal., 2015).

The benefits of school meals vary from country to country, In developed countries the school meal is a source of nutritious meals, in developing countries it is an incentive to send children to school and continue their education. It also food security at times of crisis and help children to become healthy and productive adults, thus helping to break the cycle of poverty and hunger (Gordon W. Gunderson 2003).

This study is designed to evaluate the proximate and minerals qualities of meals served as lunch inselected public and private primary schools in Ilaro.

MATERIALS AND METHOD

MATERIALS FOR DATA COLLECTION

The following materials were used for the collection of data from the respondents:

1. Disposable plate with cover
2. Sellotape

METHOD

Disposable plate with cover was used to collect samples of lunch served in two different primary schools (Public and Private) for 3 days and sellotape was used to tag the food samples in order to differentiate them.

DATA ANALYSIS

Sampled lunch collected was taken to the laboratory for proximate and micronutrient analysis.

The data gotten from proximate analysis and micro nutrient analysis were subjected to descriptive statistics using mean and standard deviation.

RESULTS AND DISSCUSSION

TABLE 1: MEAN VALUES Of PROXIMATE COMPOSITION OF SELECTED SCHOOL LUNCH

S/N	Sample	Moisture Content	Crude Protein	Carbohydrate Content	Crude Fiber Content	Crude Fat	Ash Content
1	**PRS day 1**	**65.67±0.03**	**9.06±0.13**	**15.79±0.10**	**1.84±0.01**	**6.36±0.09**	**1.28±0.01**
2	**PRS day 2**	**64.35±2.00**	**11.11±0.26**	**6.99±1.50**	**4.62±1.23**	**11.12±0.58**	**1.81±0.05**
3	**PUS day day 1**	**70.63±3.68**	**18.38±1.89**	**3.78±0.54**	**0.42±0.02**	**5.23±1.36**	**1.06±0.02**
4	**PUS day 2**	**59.46±3.56**	**14.86±2.78**	**8.80±2.17**	**4.82±1.05**	**9.15±1.35**	**2.91±0.01**
5	**PUS day 3**	**69.15±3.45**	**10.11±1.25**	**5.57±2.35**	**5.69±0.25**	**7.12±0.52**	**2.37±0.50**

Values presented are the mean values of the replicate of each sample.

Note: Proximate Results are in g/100g sample Source: Field survey August (2019)

KEYS:

PRS day 1 (Private School): Rice+ Spaghetti + Meat

PRS day 2 (Private School): Jollof rice + Fish

PUS day 1 (Public School): Beans

PUS day 2 (Public School): Rice and Beans + Fish

PUS day 3 (Public School): White rice + Vegetable soup and egg

TABLE 2 : MEAN VALUES Of MICRO /MINERAL CONTENT OF SCHOOL LUNCH

S/N	**SAMPLE**	**Vit.A (µg/100g)**	**Fe (mg/100g)**	**Ca (mg/100g)**	**Zn (mg/100g)**	**I (Mg/100g)**
1	PRS day 1	88.56±2.56	1.62±0.01	18.76±1.62	2.14±0.05	5.67±0.03
2	PRS day 2	181.34±3.66	1.2±0.01	14.11±1.53	2.62±0.07	6.81±0.05
3	PUS day 1	124.34±2.88	3.86±1.50	12.81±1.50	1.16±0.01	4.11±0.04
4	PUS day 2	211.86±4.06	2.16±0.05	8.92±1.32	1.86±0.03	5.12±0.03
5	PUS day 3	168.36±3.50	12.12±1.50	6.36±1.20	2.81±0.09	6.36±0.05

Values presented are the mean values of the replicate of each sample

Note: Minerals Results are in g/100g sample Source: Field survey August (2019).

DISSCUSSION

DISSCUSSION OF PROXIMATE COMPOSITION OF SCHOOL MEALS

Result of proximate composition of school lunch revealed that the moisture content of meal served as lunch in PRS day1(Rice + Spaghetti + Meat) and PRS day 2 (Jollof rice + fish) ranged from (64..35±02.00 to 65.67 ± *0.03)* crude protein (9.06±0.13 to 11.11 ±*0.26*), carbohydrate (6.99±1.50 to 15.79 ± *0.10*), crude fiber (1.84±0.01 to 4.62 ±*1.23*), crude fat (6.36±0.09 to11.12 ±*0.58*), and ash content(1.28 ±0.01 to 1.81 ±*0.05*)respectively. The proximate result of crude protein is in consistent with the report of American journal of clinical nutrition (2010) which states that the RDA of protein for children ages 9 to 13 years of 34grams per day (11.3g ⅓ of 34 g). This implies that the meal served in PRS day 1and day 2 is highly proteineous.

The result of carbohydrate of PRS day1 and day2 is very low (16.99 ± *1.50 to* 15.79 ± *0.10*) compared to RDA of carbohydrate (43.3g ⅓ of RDA per day). This is not in agreement with the opinion of Smarthers (2008) IOWA State University USA (2008) which state that carbohydrate provides fuel for the central nervous system and energy for working muscle. This implies that the PRS day1 and day 2 meals cannot supply enough energy for working muscle.

The result of crude fiber of PRS day1 and day 2 is (1.84± 0.01 to 4.62 ±*1.23*) which is low compared to RDA for fiber (25g/day i.e. 7.3g one third) of RDA per day. This is not in agreement with the opinion of Dietician Association of Australia (2014) which states that children and adults need 20 to 30grams per day.

The result crude fat of PRS day1 and day2 is (6.36 ± *0.09* to11.12 ±*0.58*) which is in accordance with the RDA of fat (25g/per day i.e 8.3) as stated by institute medicine (2017), Healthy children.org (2012) and Boukelif (2013). Fat is an essential part of our diet and is important for good health. The proper amount of fat supplies energy, helps the body to absorb certain vitamins. Healthy children.org (2012).

The result of proximate composition of school meal served in PUS day1, day2 and day3 revealed that moisture content of (bean, rice and bean + fish, white rice + vegetable soup and egg) Ranged from (59.46± 3.56 to 70.63 ±*3.68)* crude protein (10.11 ± 1.25 to 18.38 ±1.89), carbohydrate (3.78±0.54 to8.80 ± 2.17), crude fibr (0.42 ±0.02 to 5.69 ±0.25), crude fat(5.23±1.36 to 9.15± 1.35), ash content(1.06±0.02 to 2.91 ± *0.01*) respectively. The proximate result of crude protein is in consistent with the report of American Journal of Clinical Nutrition (2010), which state that the RDA of protein for children age 9 to 13years is 34g/per day that's (11.3⅓ of 34g). This implies that the meal served in PUS is highly proteineous.

The result of carbohydrate of PUS day1, day2 and day3 is very low compare to the RDA for carbohydrate (43.3g ⅓ of RDA per day). This is not in agreement with the opinion of Smarthers (2008) which state that carbohydrates are essential for proper body function and the body requires large amount of them. This implies that meal serves in PUS day 1, day 2and day 3 are not rich in carbohydrate.

The result of crude fiber of PUS day1, day2 and day3 is (0.42 ±0.02 to 5.69 ±0.25) which is low to that of the RDA for fiber (25g/per day in 8.3g one third) of the RDA per day. This is not in agreement with the PDA of Dietician Association of Australian (2014). That states that children and adults need at least 20 to 30 grams per day which will help to regulate the body's use of sugars, helping to keep hunger and blood sugar in check.

The result of crude fat of PUS day1, day2 and day3 ranged from (5.23±1.36 to 9.15± 1.35) with PUS day 2 having a value which is a little above the RDA of fat 25g/day (8.3g ⅓ of RDA/day). As stated by Institute of medicine (2017), Healthy children. Org (2012) and Boukelif (2013) that fat is an essential part of our diet and is important for good health.

THE DISSCUSSION OF MINERALS ANALYSIS OF MEALS SERVED IN PUBLIC SCHOOL AND PRIVATE SCHOOLS

The result of the minerals analysis of school lunch reveals that vitamin A content present in the meal served in PRS day1 and day2 ranged from (88.56±2.56 to181.34±3.66), calcium (14.11±1.53 to 18.76±1.62), zinc (2.14±0.05 to2.62±0.07), and iron (1.2±0.01 to 1.62±0.01) respectively. The result of vitamin A is 88.56±2.56 to181.34±3.66 which is very low compared to the RDA of vitamin A (200µg ⅓ of RDA per day). This is not in agreement with the opinion of Food and Nutrition Board, (2001). Which states that vitamin A is important for growth and development and for the maintenance of the immune system and good vision. Fennema O (2008).

The result of Calcium of PRS day 1 and day2 is (14.11±1.53 to 18.76±1.62) which is low, compared to the RDA of calcium (1,300mg/day i.e. 433.3mg ⅓ of RDA per day). This is not in agreement with the opinion of Food and Nutrition Board (2011). Which state that it is important for proper mineralization of growing bones, attainment of peak bone mass.

The result of Zinc of PRS day1 and day2 is (2.14±0.05 to 2.62±0.07) which is almost close to RDA of zinc (8mg/day i.e 2.7mg ⅓ of RDA per day) this is in agreement with Food and Nutrition Board, (2001). Which states that Zinc is required for the functioning of the immune system and in the structure and function of the skin, plays a vital role in wound healing. Philips et al; (2006).

The result of Iron PRS day1 and day2 ranged from (1.2±0.01 to 1.62±0.01) which is low compared with RDA for iron (8mg/day i.e. 2.7mg ⅓ of RDA per day) which is not in agreement with Food and Nutrition Board (2001). iron is required for normal energy to metabolism and for the metabolism of drugs and foreign substances that need to be removed from the body. Butte N (2006).

The result of the minerals analysis of school lunch reveals that vitamin A content present in the meal served in PUS (public) day 1, 2 and 3 ranged from (124.34±2.88 to 211.86±4.06), calcium (6.36±1.20 to 12.81±1.50), zinc (1.16±0.01 to 2.81±0.09), and iron (2.16±0.05 to 12.12±1.50) respectively. The result of vitamin A which ranges from (124.34±2.88 to 211.86±4.06) with that of day 2 (211.86±4.06) which is a little higher compared to the RDA of vitamin A (200µg ⅓ of RDA per day). Is in agreement with the opinion of Food and Nutrition Board, (2001). Which states that vitamin A is important for growth and development and for the maintenance of the immune system and good vision. Fennema O (2008).

The result of Calcium of PUS day1, day2 and day3 ranged from (6.36±1.20 to 12.81±1.50) which is low, compared to the RDA of calcium (1,300mg/day i.e. 433.3mg ⅓ of the RDA per day). This is not in agreement with the opinion of Food and Nutrition Board (2011). Which state that calcium is important for proper mineralization of growing bones, attainment of peak bone mass.

The result of Zinc of PUS day 1, day2 and day3 ranged from (1.16±0.01 to 2.81±0.09) with that of day3 (2.81 mg) a little above the RDA of zinc (8mg/day i.e. 2.7mg ⅓ of RDA per day), is in agreement with the opinion of od and Nutrition Board, (2001). Zinc is required for the functioning of the immune system and in the structure and function of the skin, plays a vital role in wound healing. Philips et al; (2006).

The result of Iron of PUS day1, day2 and day 3 ranged from (2.16 ± 0.05 to 12.12±1.50) which is in line with the RDA of iron (8mg/day i.e. 2.7mg ⅓ of RDA per day) and that of Food and Nutrition Board (2001). Iron is required for normal energy to metabolism and for the metabolism of drugs and foreign substances that need to be removed from the body. Butte N (2006).

CONCLUSSION

This work has provided baseline information on meals (lunch) served in public (PUS) and private (PRS) primary schools in Ilaro.

The proximate composition of meal served in both schools are highly proteineous and rich in fat. This is because of the values obtained from those foods which are consistent with Recommended Dietary Allowance (RDA) for ages 9-13 years. However, the meals are low in carbohydrate and crude fiber.

The mineral content of meal served in both public and private school are very low in vitamin A and calcium. This may make majority of the school children to have lower immunity leading to frequent ill health and poor growth and development. However, the meal served in both schools are rich in Zinc and that of Public school is rich in Iron.

A healthy diet is what makes a healthy person. When one is healthy, we often think of mental alertness, energy, good sight and sparking eyes on the side of an individual.

5.2 RECOMMENDATIONS

The following are recommended

1.There is urgent need for parent to get awareness of nutrients present in foods . This will enable them to serve foods rich in Macro and Micro nutrients so as to make the children grow healthy and have high intelligent quotient.

2.Protein rich food such as egg, a glass of milk and vitamin C rich fruit e.g. orange, and papaya should be consumed daily

3. Eat whole fruits instead of drinking fruit juices and replace white rice, bread, and pasta with brown rice and whole grain products.

4.Parent should choose a diet with plenty of vegetables and fruits.

5.School meal provider should choose a diet low in fat, saturated fat, and cholesterol.

6.Choose a diet that provides enough calcium and iron to meet their growing body requirements.

7.Teach children from an early age about nutrition, foods, drinks, healthy eating and drinking.

8.Choose a diet moderate in sugars and salt. Avoid giving large amounts of sweet deserts, soft drinks, fruit-flavored drinks, sugar-coated cereals, chips, or candy, as they have little nutritional value.

9.Nutrition intervention such as “dietary diversification” is one of the startegy to reduce the occurrence of micronutrient malnutrition.

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CHAPTER 5

5.0 CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

This work has provided baseline information on meal (lunch) served in public (PUS) and private (PRS) primary schools in Ilaro.

The proximate composition of meal served in both school (i.e PUS and PRS) are highly proteineous and are rich in fat. This is because of the values obtained from those foods or meals are consistent with Recommended Dietary Allowance (RDA) for ages 9-13 years. However, the meals are low in carbohydrate and crude fiber.

The mineral content of meal served in both public and private school are very low in vitamin A and calcium. This was responsible for majority of the school children not having ideal height for their ages (Nutritional Status). However, the meal served in both school are rich in Zinc and that of PUS (Public) is rich in Iron.

5.2 RECOMMENDATION

There is urgent need for parent to get awareness of nutrients present in food or adequate nutrition. This will enable them to serve food rich in Macro and Micro nutrients so as to make the children grow healthy having ideal height for their ages.