Food education: an essential tool for stimulating households' cognition of nutritional values of safe and quality food consumption in Nigeria

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Food consumption, especially when nutritionally balanced, is crucial to survival and healthy living of individuals across the globe. As a result, accessibility and affordability of quality food by households becomes essential, particularly in a developing country like Nigeria, where food supply is inadvertently inadequate due to poor system of agricultural practices, postharvest handling and poor-resource status of most of the households in the country. This notwithstanding, efforts are made to ensuring availability of food resources of various kinds for households consumption. Commonly available crop-based food in the country include fruits, vegetables, grains, legumes, tubers, roots, and meat sources, namely fish, snails, poultry and beef, and other animal products. Consumption of these classes of foods are though processed or prepared into dishes of different kinds, attendant challenges in consumption of the available food resources include heavy dependent of most households on carbohydrate-laden foods with less consumption of protein and vitamin-rich foods, and poor quality of the food for safe consumption. The resultant effect of this is poor health condition often reflected in form of undernourishment and malnutrition. In children is a reflection of stunt growth and underweight. For the poor feeding condition to be alleviated, it becomes essential to have the households educated on nutritional values of food and pattern of consumption. Food education, which entails provision of technical information on nutritional content of specific food sources, is meant to give the needed insight to households on the specific kind of food or combination of foods to be consumed on daily and regular basis. Such educational provision, not only serves as enlightenment of the households on food nutrition, but empowers them to cognitively take the initiatives for food selection for safe consumption with a view to enhancing their health status.

Keywords: Food resources; food nutrients; food education; safe and quality food consumption; Nigeria

1. Introduction

Among the basic and essential needs of life, food outstandingly remains the prime of them all on the ground that it is crucial, not only to man's survival but his quality living. The value of food is obviously reflected in its necessity **for growth and maintenance of the body; it provides the body with** needed calories for energy building and strength development for body fitness.Food provides essential nutrients to keep the body healthy and as well enhances the physiological functioning of the body in terms of maintenance of the heartbeat, homeostasis, and brain and organ activities[1]. Derivation of energy from food is brought about by breakdown of the food molecule in the process of digestion. The energy, which is then converted to glucose, fuels the operation of the body cells and organs as a system. Emphasising the importance of food, it was stressed that nutritional value of food cannot be replicated by nutritional supplements on the ground that proper foods provide calcium to build and strengthen bones, protein and iron for muscle maintenance and other nutrients that allow the optimal functioning of the body's organs. In view of this submission, it suffices to say that, food should not just be adequately available to mankind at all times and at affordable rate, but should be nutritionally-rich for a guaranteed healthy and quality living.

Agriculture however remains the main source food for mankind and this may be gotten directly from farms or markets in the raw form and in the processed form from open markets and stores. In this wise, man's efforts had largely been directed at ensuring sustainable food production, widespread distribution, accessibility and affordability for regular consumption and derivation of physiological, psychological and social benefits. To boost agricultural production, investment in agricultural research and development has been on the increase with a view to developing new or improved technologies and practices for farmers' adoption and adaptation in their farming environment. Alongside research and development in agriculture is dissemination and sharing of agro-knowledge on production technologies and innovative practices among the farmers, and development of production capacity of the farmers.The cumulative result of agricultural research is increased agricultural productivity [2]. On this account, the whole world is no longer short of food as agricultural development has been able to respond to the rising demand for both crop and animal-based foods [3].

2. Food situation in Nigeria

Nigeria though runs an oil-based economy; agriculture equally plays significant roles in the nation's economy accounting for 40% of the nation's Gross Domestic Product (GDP) and provides employment, both formal and informal, for about 60% of the Nigerian population. Commonly produced crops and farm animals are however

determined by the agro-ecological features of the different regions of the country. With farm enterprise production across the country, the nation has the potentials for feeding of its teeming population, producing as much as 6.7milliom tons of rice; 70, 000 tons of wheat; 10.7million tons of maize; and 679, 000 tons of soybean; and 50million tons of cassava as at 2014, largely for both home consumption and to some extent [4] [5]. Alongside crop production is livestock production in the country where farm animals such as cattle, sheep, goats, poultry, pigs and fish are largely reared for home consumption. The rural environment though constitutes the main base of agricultural production in Nigeria; field observation shows that agricultural practice is fast growing in urban environment, with the average to low income earning households cultivating food crop of choice and farm animals at subsistent level for meat, milk and egg production in the country.

Given the agricultural production efforts in Nigeria, it is unfortunate that the mode and status of agricultural production in the country has not really transform the country into a food secure nation; and as such the home-based food supply system has not kept pace with the growing population. In the light of this, Nigeria is said to be food insufficient given that the nation's average growth rate of food demand is 5% per annum against the annual growth rate of food supply at 3%. In addition, about 5% Nigerians are food secure, 65% are semi-food secure and 30% are food insecure. In addition to farming for food production in Nigeria, the country had equally resorted to food importation with a view to meeting the food demand of its teeming population [6].

Notwithstanding the state of Nigerian agriculture and production system, the nation has resorted to food importation as alternative to taking care of shortfall in home production. Nigeria spent about US$11billion (₦3.1trillion) on importations of four major food sources, which are rice, wheat, sugar and fish annually [7]. In line with this, the country is known to have spend a whopping $2billion dollars importing about six million tons of wheat, $750 million on rice $700 million on sugar and $500 million on milk and other dairy products [8]. As at 2013, Nigeria's food imports, was 2.187million metric tons of rice, 4.356million metric tons of wheat, 1,200 metric tons of maize and 12, 757metric tons of soybean [9]. Reflecting on the estimates of food importations in 2010, Nigeria spent as much as US$635 billion on wheat, US$356 billion on rice, US$217 billion on sugar and US$97 billion on fish as at 2010 [10]– a trend that has not abated till date due to poor state of the country's agriculture.

Nigeria's dependent on food importations may though be of great implications for the country's economy, particularly affecting the average to low-income earning households in the face of global rise in food prices; the resultant effect of the importations, alongside the home food production is sustained food supply system in the country; which has thus bailed the nation out of the prospect of large scale famine. In the light of this, Nigeria is though food deficient. it has not suffered any major catastrophe that could precipitate scourges of famine, mass hunger and food crisis [8].

3. Food types and their nutritional values in Nigeria

Given that efforts are ever geared toward improved agricultural production in Nigeria, and coupled with food importation in the country, it suggests that food production and distribution remained sustained in the country. In other words, every inhabitants of the country could in one way or the other have access to food for consumption. Such foods, which are available in various kinds, could be sourced either directly from farms or purchase in the open markets. The commonly available food in the country thus cut across the six classes of food groups, namely carbohydrates, protein, fats and oil, mineral, vitamins and water. In the light of this are the following commonly available food types and categories in Nigeria:

- **Tuber crops:** cassava, yam, potatoes and cocoyam (taro)
- **Cereals:** maize, rice, wheat, millet and guinea corn
- **Legumes:** cowpea, soybean and groundnuts
- **Fruits:** banana, mango, cherry, pine apple, almond, pawpaw, watermelon, citrus, apple, carrots, sugar cane, garden egg, cucumber
- **Vegetables:** amaranths, waterleaves, pumpkin leaves, cabbage, jute mallow, okra, *Ogbono* (African bush mango)
- **Oil-based foods:** palm oil, groundnut oil and melon oil
- **Spices:** pepper, onions, tomatoes, *iru* (Parkia biglobosa)
- **Meat sources:** cattle, sheep, goats, poultry, pigs and fish
- **Animal products:** meat, milk and eggs
- **Other common food resources:** Bread, macaroni/pasta, semovita, yoghourt, fruit juice

The food resources are however processed into different dishes for consumption. For instance, cassava may though be consumed as tuber when boiled; it is largely processed into local food stuffs such as *gari* (granular in texture)*, elubo lafun* (powdery in texture)*, fufu* (paste or powdery in texture) and tapioca which are then process into consumable dishes such as *eba, amala, fufu* and tapioca pap. These dishes constitute staple foods in Nigeria, particularly in southern region of the country, where cassava is widely cultivated and locally consumed. These cassava-based foods are however often consumed with stew of various kinds. On a similar note, yam is consumed when boiled, fried, roasted or prepared as porridge. Boiled yam is consumed with either palm or groundnut oil or fried egg. It could as well be pounded or

prepared; and where yam has been processed into yam flour, locally referred to *elubo isu,* it is prepared as *amala,* particularly among the Yoruba tribe in the country. Pounded yam and *amala* are thus consumed with stew of various kinds as may be desired by individual or households. While *amala* may be common to southwest Nigeria, *eba/gari and fufu* are common to both southwest and southeast regions of the country. Cocoyam is equally common to both regions where it is consumed boiled, fried or pounded. Potato is however common to all regions of the country where it is largely consumed in boiled or fried forms. Among all the available food resources for consumption in Nigeria, cassava and cassava-based foods are cheapest food resource and serves as hunger-relieving food.

Following tuber crops is wide consumption of cereal crops such as maize, rice, wheat, millet and guinea corn across the country. Among these grains, rice stands out as the most widely consumed of them all. It constitutes a major staple that alternates between tuber crop-based foods on daily basis. Rice is most prepared and consumed as white rice, jollof rice, fried and coconut rice. The white rice is mostly taken with pepper stew and sometimes with fried plantain, locally referred to as *dodo* in southwest Nigeria. In northern part of the country, white rice is pounded to form *tuwon shinkafa*, which is taken with a bit of powdery pepper and groundnut oil. In southwest and southeast regions, rice, to a lesser extent, is grinded into powdery form – grind rice, such that its preparation for consumption takes the same form as *amala or eba* and thereof taken with stew of choice. Maize on the other hand is mostly consumed as boiled maize around the country; and sometimes allowed to dry and grinded to powdery form for preparation of pastry food locally referred to *tuwo* in southwest Nigeria and *tuwon masara* in northern region. Other food sources from maize when fermented include *eko and ogi (pap),* but these are less taken as part of normal meal. Wheat is mostly taken in different forms which are wheat pap – when fermented, and wheat *amala* – a solid food similar to *amala* made from cassava and yam powder and consumed with stew of choice. Millets and guinea corn or sorghum are mostly processed into pap, after fermentation, in southern part of Nigeria while they are processed into *fura,* often consumed with local milk commonly known as *nono,* largely in the northern region of the country or among the Hausa tribe.

Among leguminous crops, cowpea stands out as the most widely consumed across Nigeria. It is prepared by boiling either with a mixture of pepper and palm oil or without any mixture in which case fried pepper stew is prepared to garnish the beans for consumption. Bean preparation may also be in mixture of plantain or yam thereby forming a resemblance of porridge. On another note, cowpea may be prepared as stew often referred to as *gebgiri*, among the Yoruba tribe in Nigeria. Such bean stew is often used to spice *amala* for consumption, mostly in southwest region of Nigeria. In addition to this is processing of cowpea into other food resources such as *moinmoin, ofuloju and akara* when grinded into paste form. While m*oinmoin* and *akara* are often consumed with pap and *eko, moinmoin* may be consumed with rice and bread. Groundnuts, whether boiled or roasted, are often taken as refreshment rather foods in Nigeria, hardly is soybean consumed as food except for consumption as soymilk. In northern part of the country, groundnuts, on extraction of oil (groundnut oil) is processed into groundnut cake, locally referred to as *kuli or kulikuli,* which is as well consumed as refreshment.

Vegetables, oils, spices, meat and fish are other essential food resources of value in the Nigeria's context. These food resources serve as component of most of the staple foods consumed by most households in Nigeria. For instance, staple foods such as *eba, amala, fufu,* semovita and pounded yam are consumed with stew mostly prepared from vegetables and pepper. Vegetables, which may be amaranths, waterleaves, pumpkin leaves, is on the other hand prepared as stew by adding vegetable of choice to the same mixture of condiment as used for pepper stew. This may however be garnished with dry fish and/or crayfish, *iru* and other seasonings. In place of preparation of vegetable as the main stew, it is prepared in small quantity with a view to serving it alongside pepper stew. Alternative to vegetable stew as support to pepper stew is jute mallow, okra or *Ogbon,* which are commonly referred to as *draw soup* due to their caustic or elastic nature. Stew is mostly prepared at interval of three to four days and kept fresh and tasty for the days it may last. With regular availability of stew at home, it becomes possible for households to have something to eat on daily basis as this is essential to consuming most food resources in the country.

Fruits such as banana, mango, cherry, pine apple, almond, pawpaw, watermelon, citrus, apple, carrots, sugar cane, and garden egg are readily available across Nigeria. Although, fruits do not constitute staple food in Nigeria, they serve as supplements to the main staple foods and are consumed as may be available and affordable among the Nigerian households. Fruits are however seasonally available in the country, with some kind of fruits available at a particular period of the year. In essence, all through the year, at least one or two kinds of fruits will certainly be available for consumption by Nigerians. In addition to availability of raw fruits across the country is availability of fruit juice either produced by home industries such as FUMAN, Chi Industry, Nigerian Bottling Company, or imported from other countries. Such fruit juice comes in various brands and sizes and are widely available both in the open and super markets across the country. On another note is availability of milk and milk produces such yoghurt, canned milk, fan ice, powdered milk, which of course are mainly produced by milk industries. Yoghourt and fruit juice are however consumed to spice up the staple food or at any other time as refreshment. This of course is largely common among the affluent ones and those with high paying jobs as result of high cost of acquiring these food resources.

Other food resources of high value in Nigeria are bread, macaroni/pasta, noodles and *semovita* which are largely industrial-based foods. These set of foods, which are more common among the urban dwellers, are gotten from open markets or supermarkets in the country. Bread, which is outstandingly common and regularly consumed by households across the country, even in the rural areas, is a product of baking industries produced from wheat flour, and more

recently from High Quality Cassava Flour, and mixture of other baking ingredients. Based on high demand, bread from fine flour is commonly available in the country; while the whole wheat bread, which is specially demanded for by those who value the product, is less available in the country. Macaroni/pasta and noodles of various brands are made by large food industries in the country and are widely available for purchase and consumption. These set of foods are though quickly prepared in a lesser time, their consumption depends on both tastes and economic status of households as they are relatively expensive in comparison with other non-industrial staple food resources which are mostly gotten either directly from the farm or in the open markets for home processing and preparation for consumption.

The highlighted food resources in Nigeria suggest that available food types in the country are rich in different nutritive values. For instance tuber crops are known to be energy-giving foods, rich in carbohydrate but low in protein content. Root and tuber crops are low in sulphur-containing amino acids and also deficient in most vitamins and minerals. Tuber crops such as cassava, potato and yam are however rich in vitamin C with the yellow varieties of sweet potato, yam and cassava rich in carotene or pro-vitamin A and significant amount of dietary fibre [11.12]. In general, cassava provides 160 calorie per 100g with about 69% sucrose and 16-17% amylase. In the same vein, yam, which is made up of 72.5% water, contains 16.8% crude fibre, 9.02% carbohydrate, 6.8% iron, 2.06% Ash and 0.83% protein. Given the nutritional value of yam, more than average energy requirement for human adult could be gotten from yam as consumption of 100gm of the tuber gives 93.6% calorie/kg of energy; and can as well sustain the daily iron requirement of all age group with provision of 6gl/100gm [13]. *Eba,* a heavy food resources made from cassava and often referred to as swallow, is 99% carbohydrate and provide about 360 calorie [14]; pounded yam provides 400 calorie, *amala isu* (made from yam flour) provides 250 calorie, 2% vitamin A and 70% iron; and *amala lafun* (made from cassava flour), as highlighted by has 1.2% protein, 1.6% crude fibre, 0.4% fat, 0.8% ash and 13% moisture [15].

Cereals or grains related food resources such as rice, maize, wheat, millets and guinea corn/sorghum are equally rich in carbohydrate and which is approximately 75% of their nutritional value. Cereals are major sources of carbohydrate, protein, B vitamins and minerals for the world's population [16]. The protein content ranged between 6–15% [17]; and are important sources of most B vitamins, especially thiamine, riboflavin and niacin and appreciable amounts of vitamin E [18]. Cereal-based foods are equally rich in minerals such as potassium and wholegrain cereals contain considerable amounts of iron, magnesium and zinc, as well as lower levels of trace elements such as selenium. Rice contains the highest level of selenium among the cereal grains, providing between 10 and 13µg per 100g [15]. Furthermore, about 28.7g and provides130 calorie per 100g; it has protein and fat contents of about 2.4g and 0.2g respectively. It however lacks most vitamins but contain 1% calcium. Maize or corn 60-70% starch and vitamins B group, D, E, K and pro-vitamin A [18]. Corn is also rich source of minerals such as potassium, sodium, calcium, magnesium, iron, copper, manganese, phosphorus, selenium, zinc and iodine. While cereals generally lack vitamin A, yellow corn is rich in yellow corn, no beta carotene.

Wheat contains a lot of starch or carbohydrate, 11% of protein, 2% of fat, 13% of fibre, 1% of mineral (iron, phosphorus, potassium, magnesium, calcium, zinc, manganese) and also high amount of vitamins of B group and vitamin PP. Wheat germs are rich in vitamin E and enzymes. Millet though contains about 63.2% starch, it is a good source of protein, containing about 13.6% crude protein, and essential amino acids, with exception of lysine and threonine, [19, 20]. The grains also contain 3.6 to 4.8% fat, vitamins B_3, A, PP, as well as mineral salts such as magnesium, potassium, phosphorus, silicon, iron and copper; but do not contain gluten. Sorghum nutritional contents consist of 70% of carbohydrates (mainly starch), and 18% protein, with significant share of lysine and tryptophan, about 5% fat, vitamins (mainly groups B), minerals, especially magnesium, calcium and iron. However, cereals lack some vitamins such as vitamin C, vitamin B12, vitamin A and, apart from yellow corn, no bet-carotene; and also low in mineral like sodium.

Leguminous-based food resources are on the other hand rich in protein, fibre, iron and potassium but low in calorie and fat. Legumes contain complex carbohydrates, protein with a good amino acid profile, important vitamins – B vitamins, folates, ascorbic acid and tocopherols, minerals antioxidants, polyphenols and numerous other phytochemicals with useful biological activities [21, 22]. In addition, legumes are good sources of water-soluble vitamins, particularly thiamine (*Vitamin B1*), riboflavin (*Vitamin B2*), niacin (*Vitamin B3*), pyridoxine (*Vitamin B6*), foliate and excellent sources of minerals such as calcium, copper, iron, magnesium, phosphorus, potassium and zinc. In addition to high protein content of legumes, leguminous crops such as beans and cowpea (pulses) store high level of carbohydrate in their dry seed but low lipid or fat content; while soybean and groundnuts (oilseeds) store high lipid content but low carbohydrate. Legumes in general are however poor sources of fat-soluble vitamins and vitamin C; and also low in sodium minerals.

Most food from roots and tubers are often consumed with stew in Nigeria with such stew made from pepper, vegetables and spices. Stew sources such as vegetables, specifically amaranth, pepper, jute and cabbage, are highly rich in vitamins particularly vitamin A and C [23]. In addition, amaranth, jute and cabbage were indicated to be rich in iron and calcium. In addition, all green, yellow and orange vegetables are rich in vitamins and minerals such as calcium, magnesium, potassium, iron, beta-carotene, vitamin B-complex, C, A and K. Melon (*egusi*) soup enriched with stockfish and meat provides about 700 calorie and about 60% fat. Stew, be it pepper or vegetable, are often prepared with vegetable fruits or spices such as red pepper, usually in form of chilli, scotch bonnet and bell types of pepper; onions and tomatoes. These are known to be rich in vitamins C, A, B_6 and magnesium. Onions however lack Vitamin

A. Palm oil and/or groundnut oil, with which stew is generally prepared, are largely rich in fat and have high calorie content. Both types of oils are however devoid of vitamins and minerals. In addition to the use for stew preparation is the use of the oils for frying food resources such as meat, fish, egg, yam, plantain, *akara* (bean cake); and mixed with bean past for production of *moinmoin*.

Alongside the nutritive value of vegetable or pepper-based stew is the nutritive value of fresh fruits. Fruits are are rich of simple sugar, fibre, enzymes, minerals and vitamins, particularly vitamin C, calcium and phosphorous. They are also energy-giving foods but have low carbohydrate, protein, fat and fibre contents [24]. Nutritive value of fruits however varies from fruit to fruit. Given the nutritive values of different fruits, guava and citrus are rich sources of vitamin C at 299 and 63-68mg/100g respectively, while banana, cashew, apple and almond are rich sources of vitamin B_1 at 150, 230, 120, 240mg/100g respectively [25]. **Riboflavin or vitamin B_2 is readily found in p**apaya (200mg/100g) and pineapple (120mg/100g). Vitamin A could be readily derived from mango (4800 i.e., per 100 g) and papaya (2020 i.e. per 100g).

Food resources such as bread, macaroni/pasta, noodles and *semovita* are equally energy-giving foods but are rich in some nutrients given the crop produce from which they are produced. About 40% of bread is carbohydrate, foliate (25µg/100g), calcium (177mg/100g) and 8–9% is protein but is low in fat (less than 3 g of fat/100 g) [15]. Fibre content of bread is however significantly higher in wholemeal and brown bread than white bread. Pasta, which is traditionally made from very hard (durum) wheat, though contains about 22% carbohydrate; it is high in protein content at about 3g/100g and calcium (7mg/100g). It is however low in fat, thiamine and iron. Animal food resources, such as meat, fish, milk and milk product are highly rich in protein, calcium.

4. Food accessibility and consumption pattern in Nigeria

Food is known to be crucial to life and as such its need for consumption cannot be taken for granted. Emphasis in this regard is underscored by a dictum in Nigeria that says, a food secured person never lies in poverty. Consequently, humans in general make frantic effort to ensure that food is regularly and adequately available for consumption. In Nigeria, food is generally gotten in two main ways; which could either be by direct harvest from personal farms and by purchase from markets or farm gates. Farm production, be it in rural or urban areas, provided the farming households direct sources of food for home consumption and where possible, have the excess for marketing. This creates an opportunity for the non-farming households to have access to food by purchase. Food purchase from the markets could either be in raw form which is then processed or prepared at home for household consumption or from street food vendors and restaurants or fast food restaurants. While the street food vendors are mostly patronised by average to low income earners, restaurants and fast foods centers are largely patronised by high income earners. In addition to farming for food production in Nigeria, the country had equally resorted to food importation with a view to meeting the food demand of its teeming population. In view of farm cultivation and massive food importation, nationwide distribution of the available foods through the local marketing structure has made food of various kinds available in the country for purchase and consumption by individuals and households at any point in time.

The extent to which food becomes accessible to households in Nigeria however depends on their production resources and/or their economic status. In views of this, socioeconomic status of individuals or households constitutes a major determinant of their level of food security [26]. Consequently, the poor-resource farmers largely produce at subsistence level for home consumption, with less quantity available for sales, while the highly resourced-farmers produce on commercial scale and as such consume from the available surplus. Economic implication of this is that, those that consume the larger proportion of food produced than what is available for marketing are usually left with the least disposable income to cater for other basic needs of life [27]. In the same vein, expenses on food by households cost as much as 60 – 70% of the annual income of most them. This situation accounted for the increased state of poverty in country. In attempt to wriggle out of poverty condition, most households, particularly the low to average income earners in the country, have resorted to reducing expenditure on food whereby they either consume less expensive food resources, which are mostly carbohydrate-laden or skip at least one meal per day. This goes in line with the submission that limited income causes people to restrict the number, quantity and quality of meals they consume, reduce the dietary variety, and look for inexpensively processed food resources [28].

In view of this, a survey on rural households' food structures shows that they consumed ₦3, 465.13 worth of carbohydrate foods; ₦750.54 of proteins and ₦191.43 of vitamins; and on the average consumes ₦1469 worth of food per month [27]. The authors however stressed that the consumed food resources were in the short falls of 18% carbohydrate and 11% protein intake over three years. A similar study on food consumption pattern among adolescent in selected southwest Nigerian secondary schools reveals a higher daily energy intake among 66% of the adolescents and higher carbohydrate intake among 62% of them against the lower intake of fat and protein among 51% and 42% of the adolescents, respectively but low iron intake [29]. In addition to this is skipping of breakfast with less consumption of fruits and vegetables; and milk and milk products. In line with this is the submission that most Nigerian households lack nutrition-oriented food for consumption as their meals are largely characterized by low intakes of protein, energy, iron, calcium, zinc, thiamin, and riboflavin in almost all age groups and in both sexes [30]. In view of this state of food consumption as observed among the Nigerian households, it suffices to say that food consumption by most households

is underscored by the need to satisfy hunger rather than the need to meet the body's nutrition requirement for healthy living. This chosen food consumption pattern accounted for widespread of malnutrition among the nation's citizens, particularly among the children under age five.

5. Health implication of food consumption pattern in Nigeria

Food consumption, as often reflected by individuals and households, is not necessarily meant for satisfaction of hunger, but for nourishment and enrichment of body's physiological and psychological functions. Adequate consumption of safe and quality food not only reduce the burden of non-communicable diseases but enhances and ensure physical growth and development of the body physiology, muscles and tissue repair, cell growth, healthy brain and organs. It also enhances strong bones and teeth, good eyesight, gives energy, prevents and fights off body disease. Poor feeding pattern however results in malnutrition underlined by either outright lack of or inadequate consumption of essential nutrients required for proper functioning and healthy maintenance of the body. Malnutrition, largely characterised by protein–energy malnutrition and micronutrient deficiencies, continues a major health burden in developing countries where hundreds of millions of pregnant women and young children particularly affected [31]. Evidence of short-term and long-term consequences of malnutrition include increased risk of morbidity, mortality and proneness to infectious diseases; hindrances of good physiological development and impaired cognitive or behavioural development in children [32, 33]; and in adulthood are reduced educational and productive capacity, and ill-health [34]. Other health related matters reflected by adults as a result of poor feeding pattern include obesity and diet-related diseases such as diabetes, hypertension or high blood pressure and heart disease [35].

On another note, marasmus and kwashiorkor, constitute the major manifestation of protein–energy malnutrition in children whereby the affected children are underweight, stunted and wasting [31]. With deviation from normal weight and height in relation to age as the standard measurement of protein–energy malnutrition in children – ie weight for age (underweight), height for age (stunting) and weight for height (wasting) [36], were able to ascertain that about 31% of all children in developing countries are underweight, 38% have stunted growth and 9% show wasting. As further stressed by the authors, the malnutrition may be severe in some children and this typified by wasting, edema or both. Most children with severe protein–energy malnutrition have asymptomatic infections because their immune system fails to respond with chemotaxis, opsonization and phagocytosis [31]. Severe protein–energy malnutrition also causes fatty degeneration of diverse organs, particularly the liver and heart; and chronic hypovolemia, which leads to secondary hyperaldosteronism. This status of malnutrition is usually manifested early in children between 6 months and 2 years of age as a result of early weaning, delayed introduction of complementary foods, a low-protein diet and severe or frequent infections [37, 38].

In addition to the health implications of the protein-energy malnutrition, poor dietary intake is known to result in micronutrient deficiency in most households around the world, particularly in the developing the countries. Such micronutrients include iron, iodine, vitamin A and zinc [31]. Iron is crucial to blood cell formation in the body and its deficiency thus results in anaemia – an ill-health situation that is characterised by deficient red blood cells or haemoglobin, or both [39]. This health condition becomes manifested in the wake of excessive bleeding, inadequate production of red blood cells, or excessive destruction of red blood cells. Iron deficiency, which rated as the most prevalent micronutrient deficiency around the world affects about 2billion people globally with about 70% of such ones in the developing countries. Furthermore, the underlying cause of poor iron intake, particularly in the right quantity and quality, is poverty status of most households. Arising from poor dietary and iron intake, about half of the pre-school children in developing countries are anaemic.

Vitamin A deficiency, which though impairs clear eyesight and proper functioning of the immune system, also contributes to anaemia by immobilizing iron in the reticuloendothelial system thereby reducing hemopoiesis and increasing susceptibility to infections [40]. On another note, diarrhea and related mortality has clearly been shown to be associated with vitamin A deficiency [41, 42]. Lack of iodine reduces the production of thyroid hormone and increases that of thyroid-stimulating hormone [43, 36]. In view of this, the thyroid gland becomes hyperplastic and goitrous leading to hypothyroidism develops. Zinc deficiency interferes with a variety of biological functions, such as gene expression, protein synthesis, skeletal growth, gonad development, appetite and immunity [44, 38]. Deficiency of this element is also a major determinant for diarrhoea and pneumonia.

Based on the foregoing, both children and adults in Nigeria are experiencing ill-health or abnormal health condition as a result of poor feeding pattern and inadequate micronutrient consumption. Effects of malnutrition though vary from city to city and between urban and rural areas, the degree of variation is found to be correlated with socioeconomic status of the households in Nigeria [45]. With regional and social disparities in Nigeria, malnutrition is prevalent in the northeast and northwest and much more among the poorest quintile [46]. In view of the criteria for the measure of protein-energy malnutrition, the observed status of malnutrition among the Nigerian households ranged between stunted (low height-for-age) and undernourished (low weight-for-age). In the same vein, about 11 million children under the age of five are stunted; and was further stressed that stunting happens when a child's brain and body do not get the right kind of food or nutrients in their first 1,000 days of life. With about half the children aged 6 to 59 months not receiving vitamin A supplementation, deficiency of this nutrient results in child growing up with lower immunity, and this readily

triggers frequent health problems and poor growth. In view of the correlation of malnutrition to child mortality is an indication that about 52% of child's death in Nigeria is attributable to malnutrition and 80% of the nation's children experienced moderate-to-mild malnutrition rather than severe malnutrition [47].

6. Food education practice in Nigeria

It is a known fact that food is crucial to both physiological and psychological growth of man; and enhances proper functioning of individuals' physiological make up and good health status. These functional roles of food are certainly accomplished only when man is placed on adequate and quality foods. In this wise, food consumption needs to be rich in all nutrients for real benefit to the body. It is however certain that a single set of food resources never contain all the required nutrients – water, carbohydrate, protein, fat, minerals and vitamins; but variety of food resources. In addition to quality food consumption is the need for safety of the food for safe consumption. For individuals or households to be conscious of the need for quality and safe food consumption, it becomes essential to have them educated on nutritional values of different food resources and proper handling of the food for safe and quality consumption. Where such food education is not in place, individuals or households become tilted toward consumption of junk or unhealthy foods. The rising case of epidemic of childhood obesity in the United States is due to consumption of non-healthy foods and to correctly solve this nutritional problem is the need for nutrition education.

Nutrition education is any type of actions designed to change knowledge, attitudes and behaviours of individuals, groups of individuals or populations to contribute to the prevention and control of malnutrition in all its forms, and any erroneous food consumption, including of course the economic aspect [48]. It as a set of planned educational activities targeted at certain population groups and aimed at acquiring healthy nutrition behaviours [49]. On a similar note is conceptualisation of nutrition education as any combination of educational strategies designed to facilitate voluntary adoption of food choices and other food- and nutrition related behaviours conducive to health and well-being [50]. American Dietetic Association – ADA conceived nutrition education as instruction or training intended to lead to acquisition of nutrition-related knowledge and/or skills and be provided in individual [51]. A common trend across these definitions is that nutrition education has to do with influencing the food consumption behaviour of certain group of people through instructional education. In essence, food or nutrition education may be described as conscious or deliberate efforts to provide certain set of people with technical information on variety of nutritious food resources and safe handling of the food with a view to influencing their food consumption behaviour toward becoming mindful of quality and safety of food types for consumption. The main goal of nutrition education is to make people aware of what constitutes a healthy diet and understand ways to improve their diets and their lifestyles [52]. The resultant effects of this is that, nutrition education helps individuals, families, and communities make informed choices about food and lifestyles that support their physiological health, economic, and social well-being.

Nutrition education generally takes place in schools, targeting young children basically because food habits in early stages of life is believed to determine practices and preferences in adulthood [52]. This is a similar experience in Nigeria where nutrition education takes place in schools for the purpose of educating school pupils and students on nutritious food and good eating habits. Teaching nutrition to children throughout their educational experience is a key to developing healthy eating habits [53]. Consequently, food nutrition takes place in Nigerian schools, though as part of health education curriculum for pupils in primary schools and part of home economics, health science and biology in secondary schools, for the purpose of influencing their eating behaviours toward safe and healthy food consumption. In higher schools, nutrition education is thought as course of discipline for development of professional food and nutrition practitioners. As reflected by the West African Examination Council's Syllabus for secondary school students (www.myschoolgist.com.ng), the nutrition education in Nigerian Secondary Schools aims at ensuring that the students acquire basic knowledge about food and nutrition; understand the relationship between nutrition and health; develop the ability to apply the general principles underlying meal planning, selection, preparation and serving of food to feed family and other consumers for different occasions; acquire research skills and use the information to experiment, develop and improve local dishes. But the fact that home environment extremely influences a child's eating behaviours [53] emphasises the need for extension of nutrition education beyond the classroom to the home environment using multiple channels of communication in the educational delivery. As further stressed by the author, integration of teachers, foodservice professionals, and family members in nutrition education strategies plays important roles in promoting life-long healthy eating habits. Consequently, schools need to reach out to parents with nutrition education with a view to shaping the parents' food consumption behaviours and reinforce the thought lessons on food nutrition in the school learners for healthy living of all.

Although, teachers and food nutrition professionals engaged pupils and students on food and nutrition education either in school environment, organised food conferences/workshop or hospitals, the practice is hardly linked with the home environment in Nigeria. That is, no conscious or deliberate nutrition education effort is put in place for education of homes and parents, but largely in formal school setting. In view of this, individuals and households in Nigeria have largely relied on their age-long food resources types and consumption pattern, as may have been inherited from parents or dictated by culture, to guide their food nutrition practise. In addition to this is informal nutrition education practice whereby people generally share information on food nutrition with one another either by physical contact or through the

internet and social media. In this wise, people are taking to different ways of improving their nutrition by exploring available food resources in the country to improve the nutritional status and healthy living. Instances in this regard are online information on food constituents, food resources and their characteristic nutrients, food combination for consumption, meal time, meals for children and other age groups. While some individuals or households with higher level of education have had taken it upon themselves to explore available nutrition information from the Internet or social media, and in some cases from radio and/or television broadcast as may be presented by resource persons on food and nutrition, to guide their food consumption and eating habits; it is extremely difficult for the less educated ones to do so, particularly for those in rural areas on account of outright absence of or poor development of basic infrastructure or communication facilities for information sourcing. This accounted for why cases of malnutrition or poor feeding pattern are higher in the Nigerian rural areas than its urban counterpart.

On another note is the value of nutrition education on food safety for safe consumption. This is underlined by the fact that nutritionally rich food does imply safe food as nutritionally rich food may not be safe for consumption. In this wise, part of the Nigerian education curriculum for students in schools centres on safe handling of food items particularly during preparation. The consulted West African Examination Council's Syllabus reveals objectives of the safe food education to include ability to apply the general principles underlying meal planning, selection, preparation and serving of food to feed family and other consumers for different occasions; understand the need for planning an efficient and safe kitchen; choose, use, care and store kitchen equipment and tools effectively; appreciate the importance of sanitation in the kitchen food preparation and service; apply basic principles underlying food processing, storage and preservation; acquire basic knowledge in consumer education; and acquire research skills and use the information to experiment, develop and improve local dishes. Education on safe consumption thus exposes the in-school learners to developing personal and kitchen hygiene in terms of general cleaning, waste disposal, pests and pest /control, as well as food hygiene in terms of food handling, identification and guard food borne diseases and food sanitation laws.

In similar way to educational dictates of food nutrition, home and environment hygiene is culturally dictated in Nigeria with the dictums: *hygienic practises override illnesses; cleanliness is next to godliness.* In this wise, Nigerian households and individuals are highly conscious of the need for maintaining hygienic environment and food consumption; and these accounted for less cases of food borne diseases in the country. Occasionally is information from the food regulatory agency in Nigeria – National Agency for Food, Drug and Administration Control (NAFDAC), on unhygienic and unsafe food resources that might be in circulation in the country for guidance of consumers and prevention of food-related diseases. This notwithstanding, it is obvious that most of the less educated and poor-resource households are less concerned with cosmetic appearance of food resources, particularly fruits, as they readily consumed dented or spotted fruits whether washed or unwashed; consumed dead animals on the ground that intensive cooking destroys germs and pathogens in foods. This suggests the need for further and strengthened food and nutrition education in the country.

7. Implications of food education for dietary behaviours of the Nigerian households

Given the role of food and nutrition education in stimulation of healthy eating behaviours and prevention and control of malnutrition in human society, its effective implementation potentially enhances improved dietary practices and motivate participants' change of dietary behaviours using the acquired knowledge and skills on how to make healthy food choices in the context of their lifestyles and economic resources (Food and Nutrition Service, 2010). In view of the mode of food education practice in Nigeria, field observation shows that individuals and households in the country have been exploring such information for improving their nutritional intake. For instance, many of the pregnant women and nursing mothers, who are mostly educated on food nutrition during the antenatal period in hospitals and health centres in the country, have taken informed decisions to ensure adequate and quality feeding during pregnancy and to the practice of exclusive breast feeding for the first six months of birth as way to nourish the child for healthy growth and psychological development; and thereafter ensure that the infants are placed on quality foods.

On weaning, the wealthy households may able to afford canned baby foods, the poor-resourced ones often resort to cheap and less nutritionally rich food for their feeding their babies, particularly pap (*ogi*) – fermented corn as meal. Realisation of this fact has brought about education of the poor-resourced households on fortified pap such that a number of grains, namely, wheat, guinea corn, millets and soybean are jointly fermented with maize and thereafter grinded to form a fortified pap or *ogi* for onward feeding of the infants. And if at all pap is to be solely made from a single type of grains it should rather be millets or guinea corn instead of maize due to high nutritional value the grain. This practise of fortified pap, which outstandingly recommended, is based on the fact that the included grains are high in protein content, which is essential to enhancing infant's growth and development.

Food consumption is a daily venture with individuals and households consuming between two and three meals per day. Of all the daily meals, field observation reveals breakfast as the most crucial given that the consumed morning food replaces the lost energy overnight as a result 'fasting in sleep' thereby re-energising the body and the brain for the day's activities. For the school-age children is also the provision of breakfast as a way to strengthen their health and ensure concentration during school learning. Although the quality and quantity of food given to a child or consumed by households is largely determined by the economic status of the child's household, the impact of food education is that

most households have found it necessary to provide breakfast, as least for the kids, and in most cases for the adolescents, if at all the adults may not take breakfast.

Most foods consumed by households often undergo one form of processing or the other in the cause of preparation for household consumption. Such preparation process causes the loss or reduction of the amount of nutrients in food, particularly processes that expose foods to high levels of heat, light, and/or oxygen. In this wise, some of the Nigerian households have taken to careful boiling or frying of foods to prevent the loss of food nutrients. For instance, against the traditional practice of parboiling or washing vegetables with hot water before cooking is now the informed practice of washing vegetables with clean but cold water and slightly cooked as stew as a way prevent the loss or reduction of its nutrition contents. Foods to be preserved, particularly fruits and vegetables, are also known to be blanched by briefly boiling or steaming with a view to killing enzymes that would otherwise cause unwanted changes to the food color, flavor, texture and nutrient density during preservation and storage. Although the rate of nutrient loss from food storage and preservation is dramatically reduced by blanching, the heating practice equally causes some nutrient loss, particularly a reduction in water soluble nutrients [54]. On a similar note is the practice of less heating of cooking (palm and vegetable) oils against the age-long practice of overheating which nutrition education has revealed to breakdown quality fats into harmful trans fats and some oils do turn rancid at high temperature.

Against the backdrop of consumption of oily and fatty foods and heavy or carbohydrate-laden, which has in turn lead to obesity heaviness of the body, is the avoidance of such types of food for fruits and lighter foods for consumption. Field observation shows that the option of fruit and light food consumption is referred to *keto* – which simply means keep-to-fit. The nutrition guides have largely been drawn from online media and sharing among friends. The resultant effect of such dietary behaviour is significant loss of weight to a desired level by individuals who had undergone such dietary practice. The loss of weight is believed to be crucial to preventing cardiovascular disease which is often manifested as high blood pressure, high cholesterol, and Type 2 diabetes [55].

Water and drinks are also essential component of nutrition and dietary intake. On this account is the influence of educative information on clean and adequate water consumption for physiological and metabolic functioning of the body system. Interactions with some individual on water intake behaviour reveals that some have made it a habit to take one or two glasses of water just before going to bed and first thing on waken up in the morning. This is based on the information sufficient water in the body system lowers blood pressure, prevents heart attack, activate internal organ and aid digestion. With regards to drinks is avoidance too much juicy and very cold drinks in order to guard against lowering the blood temperature and prevents pneumonia.

Hygienic practice is crucial to ensuring safe food consumption. With food education on safe food handling for safe consumption is the informed choice of mindful of food handling by individuals and household in Nigeria. Interactive with some households in southern part of Nigeria reveals that they maintain the hygiene of the kitchens, cutting and cooking utensils, and also have their hands washed before touching foods in order to avoid food contamination. Rather than leaving food opened they ensured that all foods are covered or kept in the fridge or safe places. On another note is consciousness of some individuals about the safety of the food items they are purchasing based on NAFDAC sensitisation of the public on need to cross check manufacture and expiry dates on food and drink products. With this, many Nigerians become sure that they are consuming safe foods and drinks.

8. Conclusion

It is an established fact that food is of great value to man in that it sustains life, nourishes the body and supports healthy living. On this account a great deal of effort is made by man to ensure that food is readily available in sufficient quantity and quality for consumption. Farm cultivation though constitutes the primary source of food production, it becomes accessible to man either directly from cultivated farms or by purchase from the from the farm gates/markets. The value of food however goes beyond the satisfaction of hunger to nourishing the body for proper physiological growth and proper function of the body system. In this wise, nutritionally rich food becomes essential. That is, food to be consumed by individuals and/or households must be variety of food resources rich in carbohydrate, protein, fats, minerals and vitamins, coupled with sufficient water. While a larger proportion of the residents of the developed and affluent countries might have access to variety of foods, even in sufficient quantities, it is not the same case with most people in the developing countries as result of poor agricultural development and poor economic status of most individuals and households in the area. In Nigeria for instance, studies have revealed that most households in the country heavily relied on carbohydrate or energy-giving food due to poor state of the country's agriculture, low-income earning and poverty status of most households of its citizens. In addition to this is rationing of food by skipping one or two meals per day as a way to cope with food shortages or inability to afford adequate food for consumption. Thus, food consumption among most households in Nigeria is meant to satisfy hunger rather than nourish the body. On this account, the common dictum that 'a secured food person is out of poverty', is born out of the need to have something to eat, so far it is not a poison, rather than have nutrient-rich food to eat for nourishment of the body. In addition to this, the country generally lacked officially institutionalised food education programme for homes and families except subject of taught in formal school setting for education of school pupils and students at the basic education level and for training and development of food and nutrition professionals, most of whom end up working in hospitals and food industries as career officers or

personnel rather than food and nutrition educators for homes and families. In place of this, the age-long food consumption practice and traditional knowledge of food value and nutrients becomes the information-base for guiding food and nutrition education of the less educated individuals and households in Nigeria, while the Internet platform becomes the information source on food and nutrition for educated individuals and family care-giver that care to know about food and its nutritional value to man. On this, account, even though a large proportion of the Nigerian citizens or households lived below the poverty line and the country lacked sufficient food, appropriate development of food and education programme, coupled with integration of impactful teaching strategies, will go a long way to guide Nigerian on right choices of food selection and development of healthy food consumption behaviours. In this wise, conscious and critical look should be given to following food and nutrition education strategies for formal implementation in the country. The nutrition education strategies which are broadly classified as individual, group and environment approaches under the California Women, Infant and Children (WIC) Program include: the learner-centred approach, educator-centred counselling/advising, motivational interviewing, and self-learning/self-study strategies as the individual learning approach; child-centred approach, family-centred approach, interactive activities, role play, video presentation, facilitated group discussion, lectures, lectures with discussion, panel of experts and guest speaker strategies as the group approach; and the use of bulletin boards, educational material rounders/racks, music, posters, props and waiting room videos as the environment approach. Implementation of any of these food and nutrition education strategies requires proper planning

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