National Nutritional Guideline

On

Non-Communicable Disease Prevention, Control and Management

Non-Communicable Disease Control Programme
Federal Ministry of Health
Abuja, Nigeria

October 2014

Foreword

Nutrition is as old as humankind, and when healthy, plays a major role in the prevention, control and management of Non-Communicable Diseases (NCDs). Conversely, unhealthy nutrition is a modifiable risk factor for developing NCDs.

Nigeria, like most developing countries, is experiencing a transition from healthy to unhealthy nutrition. This is partly due to rapid urbanization and globalization as well as improvement in socioeconomic status of Nigerians. These have imposed new lifestyles and risky behaviours with attendant increase consumption of processed foods and high-calorie diets. The consumption of fibre-rich foods has significantly declined, leading to overweight and obesity with increased risks for NCDs especially cardiovascular diseases, cancer and diabetes mellitus.

In recognition of the role of nutrition in NCDs, the Federal Government of Nigeria through the Non-Communicable Disease Control Programme of the Federal Ministry of Health deemed it necessary to put together this National Nutritional Guideline on Non-Communicable Disease Prevention, Control and Management. This guideline is for use by all Nigerians especially health professionals and those who have already developed any of the diet-related NCDs discussed in this document.

I sincerely appreciate our NCD experts, stakeholders and staff of the Ministry for their efforts. This guideline is indeed timely and apt as it came at a time when food production is being thwarted by climatic and social factors. It is therefore my earnest desire that every Nigerian utilizes this useful document to enable them manage and reduce risk of NCDs, so that we can collectively achieve the ultimate goal of reducing the burden caused by NCDs in Nigeria.

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Honourable Minister of Health
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Abbreviation and Acronyms

Abbreviation/acronyms	Meaning
AKTH	Aminu Kano University Teaching Hospital
CBO	Community Based Organization
DHS	Demographic Health Survey
DM	Diabetes mellitus
DPC	Disease Prevention and Control
FAO	Food and Agriculture Organization
FBOs	Faith Based Organizations
FCTC	Framework Convention on Tobacco Control
FMOH	Federal Ministry of Health
FRSC	Federal Road Safety Commission
GYTS	Global Youth Tobacco Survey
HPRS	Health Planning Research and Statistics
IDSR	Integrated Disease Surveillance and Response
ISH	International Society of Hypertension
LGA	Local Government Area
MNT	Medical Nutrition Therapy
NBS	National Bureau of Statistics
NCDs	Non-Communicable Diseases
NDHS	National Demographic Health Survey
NGOs	Non-Governmental Organizations
NHMIS	National Health Management Information System
NPC	National Population Census
NPHCDA	National Primary Health Care Development Agency
PHC	Primary Health Care
PLCC	Primary Liver Cell Carcinoma
PLWSCD	People Living With Sickle Cell Disease
RCORTI	Regional Centre for Oral Health Research and Training Initiatives for Africa
SCD	Sickle Cell Disease/Disorder
SMOH	State Ministry of Health
UBTH	University of Benin Teaching Hospital
UCH	University College Hospital
UCTH	University of Calabar Teaching Hospital
UDUTH	Usman Danfodio University Teaching Hospital
UMTH	University of Maiduguri Teaching Hospital
UN	United Nations
VIA	Visual Inspection of Cervix Stained with Acetic Acid
WHO	World Health Organization

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1.0. Introduction

1.1. Background

Non-Communicable Diseases (NCDs) are group of diseases that are chronic in nature, not contagious but reduce the quality of life of the affected individuals and can also lead to death.

NCDs are the leading cause of death globally killing 36 million people every year. It is projected that NCDs would increase by 17% in the next 10 years in the developed world and by 27% in the developing countries especially in Africa. It is estimated that more than 30% of healthcare cost will go for the management of NCDs in the next 10 years.

The 1990 – 1992 national survey on NCDs shows that the prevalence of hypertension was 11.2% while that of diabetes mellitus was 2.7% (1.05 million Nigerian above 15 years). However with the definitional shift of 140/90mmHg in 1999, the prevalence of hypertension now exceeds 20%. The prevalence of sickle cell disorder is 0.5% and that of the sickle cell trait (AS) accounts for 23.04% of the population.

1.2 List of Major NCDs in Nigeria:

a) Cardiovascular diseases including hypertension
b) Diabetes mellitus
c) Chronic respiratory diseases e.g. asthma
d) Cancer
e) Sickle cell disorder
f) Mental health disorders
g) Oral health diseases
h) Violence and injuries, etc.

1.3 Risk Factors for NCDs

NCDs are associated with some identifiable risk factors that are broadly divided into:

a) Lifestyles/Personal behaviour
b) Genetic makeup
c) Environmental factors including climate change

More than half of these three categories of risk factors are as a result of poor lifestyle choices which are modifiable such as drug use, harmful use of alcohol, tobacco use, unhealthy diet and lack of physical exercise or poor stress management. These risk factors could lead to overweight, obesity, raised blood pressure and high blood levels of glucose and cholesterol.

1.4 Unhealthy Nutrition and NCDs

Improving nutrition is the most fundamental and impactful way of tackling NCDs. The top six diseases that are responsible for 70% of death worldwide are actually modifiable with nutritional intervention. Underweight, overweight and obesity have a direct impact on the

global rise in NCDs. While under-nutrition kills in early life, it can also lead to increased risk of NCDs and death in later life.

Dietary transition in the developing world is closely linked to social and economic changes. Many of these changes relate to globalization; new food items, new marketing strategies and new dietary habits have emerged. Social mobility through migration and urbanization has exposed people to these new foods and encouraged new ways of eating. Consumption of meat, eggs and dairy products has increased while the proportion of starchy staples has declined.

Increased consumption of animal products or other high-fat condiments has often compensated for the reduction in staple consumption. Eating outside the home and snacking have become more common. More processed foods with saturated fats and trans-fats have become available for a larger proportion of the population. Increased consumption of energy and fats has often been accompanied by decreased physical activity, which has led to overweight and obesity.

It is obvious that influencing public nutrition is a key task in the global strategy for the prevention of NCDs.

1.5 Purpose of the Guideline

This guideline is meant to provide information and knowledge on good nutrition that is essential in the prevention and management of NCDs. This guideline can be used by the general public including the following:

a) Individuals
b) Households
c) Health workers
d) Health institutions
e) Educational institutions
f) Corporate organizations
g) Food industries, eateries, hotels, restaurants etc.

1.6 Climate Change and Foods

Climate Change is a topical issue in the world agenda today as it poses serious threat to the survival and sustainable development of humanity. According to the United Nations Framework Convention on Climate Change (UNFCCC), climate change means "a change which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time period".

If current trends continue without appropriate mitigation and adaptation, humanity and the entire ecosystem is unlikely to withstand the negative impact.

1.6.1 Effects of Climatic Change

All populations are vulnerable to climate change but the worst hit are the low-and middle-income countries. Global warming arising from climate change will lead to the following:

a) Increase in the prevalence of heat stroke and heat stress.
b) Increase in the concentration of salt in drinking water and the soil thus increased risk for hypertension.
c) Rising level of sea water leading to flooding and erosion and attendant problems such as population displacement, relocation, overcrowding, conflict/war, food and water shortage, violence and injuries.
d) Increase in the prevalence of Mental Health Disorder e.g. depression, post-traumatic stress and conversion disorder.
e) Increase in air pollution/aero-allergens leading to chronic obstructive pulmonary disease including allergic conditions e.g. asthma.
f) Increase in prevalence of skin cancers due to effect of excessive UV-radiation on the skin.
g) Change in the pH of rain causing skin and eye irritation, which may also lead to blindness.

1.6.2 Adaptation and Mitigation Strategies:

a) Advocacy, awareness creation and capacity building on climate change as a major health security issue.
b) Promotion of green initiative (afforestation, reforestation and revegetation).
c) Development of clean and renewable energy technology:

- Reduce, reuse, recycle (recycle ½ household waste-save 2400 pounds).
- Use less heat and air conditioning.
- Drive less and drive smart.
- Buy energy-efficient products e.g. energy efficient light bulb.
- Use motion sensors that switch electrical appliances on and off to save electricity.
- Manually switch electrical appliances off when not in use to save electricity.
- Encourage others to conserve energy.

d) Improve agriculture and transport system.
e) Improve construction activities and town planning.
f) Improve food storage and reservation in large scale.

2.0. Classification of Foods

2.1 Classification of Foods Based on Nutrients

Foods are classified into six groups based on nutrients- proteins, fats, carbohydrates, minerals, vitamins and water. The food supplied to the body consists of various elements. Most foods contain all these classes but in varying proportions. Proteins, fats and carbohydrates are often termed proximate principles. Together with water, they form the main bulk of food. The human body is built up from the six constituents, and has the following approximate composition: water 63%, protein 17%, fat 12%, minerals 7%, and carbohydrates 1%. However, the main functions of food are:

a) Provision of energy
b) Body building and repair
c) Maintenance and regulation of tissue functions.

2.1.1 Proteins

The protein foods are much more complex in character and all contain nitrogen, an element which is essential to life. Proteins contain carbon, hydrogen, oxygen, nitrogen and sulphur in varying amounts. Some proteins also contain phosphorus and iron, and occasionally other elements. One gram of protein yields about 4 calories of energy.

a) Sources

Proteins are found in both animal and vegetable foods. The animal sources of protein are milk, eggs, chicken, meat, fish, liver, snail, kidney, crayfish, periwinkle, etc. Vegetable proteins on the other hand are found chiefly in the pulses such as lentils, baobab, peas, beans, soya beans, locust beans (iru, dawadawa), bambara nuts (okpa), groundnuts, pigeon pea, and pumpkin seed. Modern nutritional scientists prefer to use the term 'protein rich foods in place of first or second class proteins. The protein rich foods of animal sources and plant sources are essential in human nutrition.

b) Functions

i. Proteins are source of energy and play a major role in the maintenance of good nutritional status. One gram of protein yields about 4 calories of energy.
ii. The body needs proteins for the following:

- Growth and development.
- Repair and maintenance.
- Synthesis of certain substances like the antibodies, enzymes and hormones.

2.1.2 Fats

Fats are important items in the diets of people. They contain carbon, hydrogen and oxygen.Fats such as butter and vegetable oils are known as 'visible' fats because it is easy to estimate their intake. However, fats present in foods such as milk, eggs, meat, and nuts are difficult to estimate and are referred to as 'invisible' fats.

a) Sources

Dietary fats are derived from two main sources:

i. Animal Sources: They are butter (including "man shanu") and fish oils like cod liver oil. Animal fats have more saturated fatty acids than vegetables fats. They also contain vitamins A and D, which are lacking in vegetable fats.
ii. Vegetable sources: They include various vegetable oils such as groundnut, mustard and coconut oil, palm oil and olive oil.

b) Functions

i. Fats are concentrated and palatable sources of food energy. One gram of fat yields about 9 calories of energy.
ii. Fats carry fat-soluble vitamins – A, D, E and K.
iii. Fats provide 'essential fatty acids'. These are required by the body for growth and maintenance of the integrity of the skin.
iv. Fats provide support for many organs in the body such as heart, kidney and intestine. Fat beneath the skin is insulation against cold.

2.1.3 Carbohydrates

Carbohydrates are the chief source of energy of the body. In most Nigerian diets, carbohydrates are present in excessive amounts, providing as much as 90% of the calories ` some cases. In adequate diets, carbohydrates should provide not more than 50 – 60% of the total calories. The carbohydrate reserve of a human adult is only about 500g. When a man fasts, this reserve is rapidly exhausted.

a) Sources

There are three main sources of carbohydrate:

i. Starches: Starches include garri, fufu, tuwo, akpu, as well as roots and tubers like yam, cassava and potato. Cereals include wheat, rice, millet, sorghum, maize, acha (*Digitaria exiles* or fonio or hungry rice) and account for most of the dietary carbohydrate.
ii. Sugar: Sugar as found in fruits; honey and things that produce sugar e.g. sugarcane. Glucose is an essential element of sugar. This is essential for children, especially during the period of teething and growth. Jams, sugar cane, fruits and honey also provide sugar.
iii. Cellulose: Cellulose is the fibrous substance of fruits and vegetables. It is hard to digest and has no nutritive value. Its main function is to serve as roughage and facilitate bowel movements.

b) Functions

i. Main source of energy, fuels in metabolic intermediates including fat production. One gram of carbohydrate yields about 4 grams.
ii. Formation of structural elements such as chitin in animals, cellulose in plants and peptidoglycan or murein in bacterial cell walls.
iii. Source of dietary fibre

iv. Formation of the structural framework of ribonucleic acid (RNA) and deoxyribonucleic acid (DNA).

2.1.4 Minerals

Dietary minerals (also known as mineral nutrients) are the chemical elements required by living organisms, other than the four elements carbon, hydrogen, nitrogen, and oxygen present in common organic molecules. Minerals in order of abundance in the human body include the seven major minerals calcium, phosphorus, potassium, sulfur, sodium, chlorine, and magnesium. Important "trace" or minor minerals, necessary for mammalian life, include iron, cobalt, copper, zinc, molybdenum, iodine, and selenium (see table 1 and 2 below).

Table 1: Sources and Functions of Trace Minerals

Trace Mineral	Sources	Functions
Copper	•Shellfish (especially oysters) •Chocolate •Mushrooms •Nuts •Beans •Whole-grain cereals	1) Helps protect cells from damage 2) Needed for making bone and red blood cells
Fluoride	•Saltwater fish •Tea •Fluoridated water	Needed for making bones and teeth
Iodine	•Seafood •Iodized salt	Needed for thyroid gland to function properly
Iron	•Red meat, such as beef •Tuna and salmon fish •Eggs •Beans •Baked potato with skins •Dried fruit, like apricots, prunes and raisins •Leafy green vegetables •Whole grains	1) Helps red blood cells deliver oxygen to body tissues 2) Helps muscles function
Selenium	•Nuts •Fish and shellfish, Red meat •Enriched breads •Eggs, Chicken •Wheat germ	1) Helps protect cells from damage 2) Needed for thyroid gland to function properly
Zinc	•Red meat (beef, pork and lamb) •Legumes	1)Needed for healthy skin 2) Needed for healing wounds, such as cuts 3) Helps body fight off illnesses and infections

Most minerals that enter into the dietary physiology of organisms consist of simple compounds of chemical elements. Larger aggregates of minerals need to be broken down for absorption.

Table 2: Sources and Functions of Macrominerals

Macromineral	Sources	Functions
Calcium	•Dairy products, such as milk, cheese, and yogurt •Canned salmon •Leafy green vegetables •Calcium-fortified foods– from orange juice to cereals and crackers	1) Needed for making bones and teeth 2) Helps nerves and muscles function
Chloride	•Salt • Tomatoes, lettuce • Olives •Beef and pork •Cheese	Needed for keeping the right amounts of water in the different parts of the body
Magnesium	•Leafy green vegetables • Nuts •Seafood •Dairy products, such as milk, cheese, and yogurt	1) Needed for making bones and teeth 2) Helps nerves and muscles function
Phosphorus	•Dairy products, such as milk, cheese, and yogurt •Red meat (beef, pork and lamb), •Poultry, fish •Eggs, •Nuts, peas	1) Needed for making bones and teeth 2) Needed for storing energy from food
Potassium	•Bananas, tomatoes •Potatoes with skins •Leafy green vegetables, like spinach •Citrus fruits, like oranges, tangerine •Dried fruits– dates (dabino) •Legumes	1) Helps nerves and muscles function 2) Needed for keeping the right amounts of water in the different parts of the body
Sodium	•Salt, milk and cheese •Beef and pork •Green olives	1) Helps nerves and muscles function 2) Needed for keeping the right amounts of water in the different parts of the body

2.1.5 Vitamins

Vitamins are organic substances that are needed in small quantity to sustain life. They are vitamins A, C, D, E, K and the B vitamins (thiamine, riboflavin, niacin, pantothenic acid, biotin, vitamin B_6, vitamin B_{12} and folate). Most of the vitamins are obtained from foods (Table 1). Others are endogenously made by the body e.g. vitamins D and K. People who eat a vegetarian diet may need to take a vitamin B12 supplement because their meals lack vitamin B_{12}.

Each vitamin has specific functions (Table 1). Low levels of certain vitamins may lead to development of a deficiency disease. For example, vitamin D deficiency may lead to rickets. Some vitamins may help prevent medical problems e.g. Vitamin A prevents night blindness.

The best way to get enough vitamins is to eat an adequate diet with a variety of foods. High doses of some vitamins can lead to disease.

Table 3: Sources and Functions of Vitamins

Vitamin	Source	Function
Vitamin A (Retinol or Beta-carotene)	Liver, egg yolk, dairy products, margarine, palm oil and fortified vegetable oils. Beta-carotene (pro-vitamin A) is found in dark green vegetables like ugwu, ewedu and in deep yellow fruits like mango, pawpaw, oranges.	• Improve vision. • Boost immunity. • Antioxidant. • Cellular regeneration.
Vitamin B_1 (Thiamine)	Cereals and enriched grain products; legumes (dried beans, peas, and nuts), organ meats, lean pork and eggs.	• Essential coenzyme that aids energy formation. • Enhance appetite. • Prevents Beriberi.
Vitamin B_2 (Riboflavin)	Organ meats, enriched breads and cereals, legumes, almonds, cheese and eggs; also meat, fish and dark green vegetables.	• Essential coenzyme in tissue oxidation and protein metabolism. • Prevent cheilosis and sore in tongues.
Vitamin B_3 (Niacin)	Meat, organ meats, whole grains and cereals, and legumes; also eggs, milk, green leafy vegetables and fish.	• Essential coenzyme in protein and fat metabolism. • Prevents pellagra.
Vitamin B_5 (Pantothenic Acid)	Organ meats, yeast, raw vegetables, eggs and dairy products.	• Essential coenzyme.
Vitamin B_6 (Pyridoxine)	Whole-grain products, poultry, fish, and nuts; also meat, most fruits and vegetables, eggs and dairy products	• Coenzyme in for amino acid metabolism. • Haemoglobin formation and thus important in haemopoesis. • Prevent dermatitis and neuritis.
Vitamin B_{12} (Cyanocobalamin)	Primarily organ meats; also fish, lean meats, poultry, cheese, and eggs.	• Important in haemopoesis. • Synthesis of DNA.
Vitamin C (Ascorbic Acid)	Almost exclusively fruits and vegetables (especially citrus fruits, orange, tangerine, grapes, tomatoes, peppers, strawberries) although breast milk and organ meats contain small amounts.	• Connective tissue formation. • Enhance wound healing and sores. • Antioxidant. • Prevent scurvy and flu.
Vitamin D (Cholecalciferol)	For most people, sun exposure is the primary precursor of vitamin D activation. Food sources include Vitamin D-fortified milk, eggs, fish-liver oils, palm oil and fatty fish such as mackerel, titus and salmon.	• Promote absorption and use of calcium and phosphate for healthy and strong bone and teeth. • Prevents rickets in children, and osteomalacia or osteoporosis in adults. • Modulates cell growth, neuromuscular and immune function.
Vitamin E (Tocopherol)	Vegetable oils, nuts, wheat germ and whole-wheat products, egg yolks and green leafy vegetables.	• Protects red blood cells. • Help prevents destruction of vitamin A and C.

Vitamin	Source	Function
Biotin (Vitamin H)	Oats, organ meats, yeast and eggs (cooked); also whole-wheat products, dairy products, fish and tomatoes.	• Coenzyme that helps the body metabolize carbohydrates, fats and amino acids.
Vitamin K	Dark green leafy vegetables, eggs, banana, plantain cheese, pork and liver.	• Necessary for normal blood clotting. • Synthesis of proteins found in plasma, bone and kidneys.
Folic Acid	Vegetables (especially dark-green ones), organ meats, whole-wheat products, legumes and mushrooms.	• Promotes normal digestion. • Essential for the formation of red blood cells.

2.2 Classification of Foods Based on Sources

2.2.1 Roots and tubers

Roots and tubers provide mainly carbohydrates. Examples include yam, cassava, cocoyam, Irish and sweet potatoes etc.

Figure 2: Cassava tuber

Figure 1: Yam tuber

2.2.2 Cereals

Cereals also contain mainly carbohydrates. They contain a little quantity of vitamins and minerals. Examples of cereals include rice, maize, guinea corn, millet, wheat, barley etc.

Figure 4: Maize

Figure 3: Rice grains

2.2.3 Legumes/Oil Seeds

Legumes contain both proteins and carbohydrates. They are sources of plant protein. Examples of legumes include beans (cowpea), soya bean, groundnut, nuts, African yam bean etc while oil seeds include ground nut, melon seeds, sesame etc.

Figure 6: Beans

Figure 5: Groundnut

2.2.4 Fruits and Vegetables

Fruits and vegetables are excellent sources of minerals and vitamins (micro-nutrients). Examples of fruits include oranges, grapes, mango, pawpaw, pineapple, bananas, cashew, guava etc. while examples of vegetables include pumpkin, tomato, carrot, spinach (aleyafo), bitter leaf, egg plant, garden egg, okro etc.

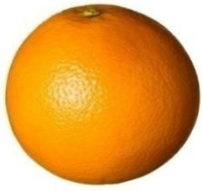

Figure 9: Orange

Figure 8: Pawpaw

Figure 7: Bananas

Figure 10: Garden egg

Figure 11: Tomatoes

Figure 12: Lettuce

Figure 14: Okra

Figure 13: Mixed Vegetables

2.2.5 Fats and Oils Foods

These are concentrated sources of energy. Examples include red palm oil, soya bean oil, coconut oil, groundnut oil, animal fats-from fatty means and skin of chicken, butter (including man shanu), margarine etc. Red palm oil also contains β-carotene which is converted to vitamin A.

Figure 16: Bottles of Palm Oil

Figure 15: Fatty Meat

Fats and oils from plant sources are better than those from animal (apart from fish) because they contain useful and health promoting fatty acids. Health promoting fatty acids are polyunsaturated fatty acids including omega-3- and omega-6- fatty acids. Examples of foods containing unsaturated fatty acids include vegetable oils and fish oils.

2.2.6 Water

It is classified as food nutrients because it plays a very important role in eating, digestion, absorption, reactions in the body and in excretion. We need about eight cups of water every day. This could be more if we are sweating or during feverish conditions and diarrhea. Children under six months old get all their water need from breast milk. Therefore, during the period of exclusive breast feeding, children should not be given water because they do not need it.

2.2.7 Meat and Meat Products

Meat and meat products are excellent sources of protein. They also contain other nutrients such as fats (if the meat is fatty), micronutrients like iron and zinc. Liver of all types is a very rich source of iron and vitamin A.

2.2.8 Milk

Breast milk can supply all the nutrients needed for the normal growth and development of infants up to six months of age. This is why children 0 – 6 months of age should be exclusively breastfed (that means such children will be given only breast milk). Children are still expected to be given breast milk even after six months along with appropriate complementary food up to 24 months. Animal milk and milk foods, such as curds, yoghurts and cheese are good sources of protein, fat, many micronutrients particularly calcium.

2.2.9 Fish and Poultry Products

These are also very good sources of protein, and fat. In addition, they supply iron and zinc. Eggs are particularly very good sources of protein, fat and many micronutrients – including vitamin A, B-complex, vitamins and minerals.

2.3 Classification of Foods based on Glycaemic Index (GI)

The GI is a ranking of foods based on how quickly they raise blood glucose levels. The reference food substance- glucose has a GI of 100. Glycaemic index and glycaemic load offer

information about how foods affect blood sugar and insulin. The lower a food's glycaemic index or glycaemic load, the less it affects blood sugar and insulin levels.

2.3.1 Impact of High GI Foods:

Foods with a high GI will raise blood sugar quickly, while those with a lower GI will raise it more slowly and over a longer period. Therefore, it is important to consume foods with a low glycaemic index. The rush of energy caused by high GI foods does not last and is soon followed by an energy lull, making the individual hungry sooner and needing more food earlier. Secondly, the body will consume the available energy in the blood first rather than stores of energy like body fat, making it harder to lose weight. The more processed a food, the higher its GI value will be.

Table 4: Various Foods and their Glycaemic Index

FOOD	Glycaemic index (glucose = 100)
Breads	
White wheat flour bread	71
Whole wheat bread	67
Beverages	
Apple juice, unsweetened	44
Orange juice, unsweetened	50
Tomato juice, canned	38
Grains	
Sweet corn on the cob	60
Couscous	61
White rice	89
Brown rice	50
Acha	35
Maize	59
Breakfast cereals	
Oatmeal	55
Dairy products	
Milk, full fat	41
Milk, skim	32
Reduced-fat yogurt with fruit, average	33
Fruits	
Apple	39
Banana, ripe	62
Plantain, green unripe	40
Plantain, boiled	38
Plantain, ripe	88.9
Dates, dried	42
Grapefruit	25
Grapes	59
Orange	40
Peach	42
Pear	38
Prunes, pitted	29

FOOD	Glycaemic index (glucose = 100)
Raisins	64
Watermelon	72
Legumes/oil seeds	
Baked beans	40
Blackeye peas	33
Soya beans	15
Cashews, salted	27
Peanuts	7
Walnut	15
Groundnut	15
Vegetables	
Green peas	51
Carrots	35
Snack foods	
Corn chips, plain, salted	42
Microwave popcorn, plain	55
Potato chips	51
Roots and tubers	
Sweet potato	46
Irish potato	71
Yam	54
Boiled cassava	46
Tapioca (‘abacha’)	35
Miscellaneous	
Honey	61

3.0. Foods and Non-Communicable Diseases

3.1 Dietary Intake and Non-Communicable Diseases

Dietary intake, which includes both the quantity and quality of foods, is highly important in the development of chronic diseases. An intake of calories in excess of what is expended during daily activity leads to obesity and an increased risk of diabetes, high blood pressure, heart disease, and some cancers. Increased physical activity can offset some excess caloric intake and may have additional healthful benefits as well. Since much of the industrialized world now has a predominance of inexpensive, calorically dense foods and too little requirement for physical activity, it is not surprising that an epidemic of obesity, and the corresponding increased risk for disease, has occurred.

As sub-Saharan African countries including Nigeria, gradually move toward economic development and industrialization, there are similar pressures toward high caloric intake and decreased physical activity. This is seen in the recent proliferation of fast food restaurants especially in the urban areas. Dietary patterns have important influences aside from the caloric content. Fruits, vegetables, and whole grain products have beneficial effects on health, as does a limitation of fat intake to no more than 30% of calories.

Other personal behaviours and circumstances contribute to NCDs development. Harmful alcohol use can have adverse effects. Non-pregnant individuals and groups consuming small amounts of alcohol (about one drink per day) experience less ischemic heart disease. However, large amounts (about four or more drinks per day) contribute to chronic liver disease, depression and suicide, and injuries, especially motor vehicular injuries. Any alcohol use during pregnancy carries a risk for impaired foetal development. Illicit drugs are addictive, impair social and occupational functioning, and are associated with impaired mental health, notably depression. Both alcohol and illicit drugs can have long-term effects on intellect. The use of tobacco is associated with NCDs such as diabetes mellitus, hypertension and high blood cholesterol.

The WHO/FAO Expert Consultation on Diet, Nutrition and the Prevention of Chronic Diseases met in Geneva in 2002 to examine the science base of the relationship between diet and physical activity patterns, and the major nutrition-related chronic diseases. Evidence from above meeting shows that the following conditions can result from unhealthy diets;

a) **Overweight and obesity:** the imbalance between declining energy expenditure due to physical inactivity and high energy in the diet (excess calories whether from sugar, starches or fat) is the main determinant of the obesity epidemic. Increasing physical activity, plus reducing intakes of foods high in fat and foods and drinks high in sugars, can prevent unhealthy weight gain.

b) **Diabetes mellitus:** Overweight, obesity, and physical inactivity account for the escalating rates of type 2 diabetes, worldwide. Diabetes leads to increased risk of heart disease, kidney disease, stroke and infections. Increased physical activity and maintaining a healthy weight play critical roles in the prevention and control of diabetes.

c) **Cardiovascular diseases:** Cardiovascular diseases are to a greater extent due to unbalanced diets and physical inactivity. Risk of their main forms, heart disease and stroke, is reduced by eating less saturated and trans-fats, and sufficient amounts of (n-3 and n-6) polyunsaturated fats, fruits and vegetables and less salt, as well as by physical activity and controlling weight.

d) **Cancers:** Tobacco is the number one risk of cancer, but dietary factors contribute significantly to some types of cancer. Maintaining a healthy weight will reduce the risk for cancers of the oesophagus, colorectum, breast, endometrium and kidney. Limiting alcohol intake will reduce risk for cancers of the mouth, throat, oesophagus, liver and breast. Ensuring an adequate intake of fruits and vegetables should further reduce risk for oral cavity, oesophagus, stomach and colorectal cancers.

e) **Osteoporosis and bone fractures:** fragility fractures are a problem of older people. Adequate intakes of calcium (>500mg/day) and of vitamin D in populations with high osteoporosis rates helps to reduce fracture risk, so does sun exposure and physical activity to strengthen bones and muscles.

f) **Dental diseases:** Caries is preventable by limiting the frequency and amount of consumption of sugars and by appropriate exposure to fluoride. Erosion of teeth by dietary acids in beverages or other acidic foods may contribute to tooth destruction.

3.2 Food Myths, Fads and Fallacies Impacting on NCDs

a) **Depriving children eggs, meat and fish to prevent them from stealing:** There is no scientific evidence to support this. Children should be fed these foods as they are critical to the healthy development and growth of the child.

b) **Avoiding beans consumption in pregnancy to prevent the foetus becoming overweight:** There is no scientific evidence to support this. Beans are a good source of protein and folic acid and are therefore an important component of a pregnant woman's diet.

c) **Avoiding pepper consumption in the first trimester of pregnancy for fear of spontaneous abortion:** There is no scientific evidence to support this.

d) **Avoiding snail consumption in pregnancy to prevent excess salivation in the newborn:** There is no scientific evidence to support this.

e) **Avoiding the consumption of chicken and certain types of bush meat (e.g. grass-cutter) in pregnancy to prevent prolonged labour:** There is no scientific evidence to support this.

f) **Denying colostrum to the newborn infant during the first 24 hours after delivery in the belief that it is harmful to the child:** In fact colostrum (the first breast milk produced, is yellow to orange in colour, thick and sticky) is very beneficial to the newborn as it is low in fat and high in concentrated nutrients. The concentration of immune factors is much higher in colostrum than mature milk. It also has a laxative effect on the baby, helping it to pass early stools thereby aiding in the excretion of excess bilirubin and contributing to the prevention as well as mitigation of jaundice. The baby should be put to breast immediately after being born or as soon as possible if there are no complications.

g) **Engaging in 'fattening', the practice of overfeeding women to make them more beautiful or healthy looking:** this practice may lead to problems of obesity, heart disease, diabetes, high blood pressure among other conditions.

h) **Feeding potash to nursing mothers:** This practice should be stopped as it can lead to heart failure.

i) **Giving a newborn pre-lactal fluid for various reasons:** Pre-lactal fluid of any kind and for whatever reason should not be given to a newborn child. Exclusive breast feeding should always be practiced.

3.3 Phytochemicals

The term "phytochemicals" refers to a wide variety of compounds produced by plants. They comprise of antioxidants, flavonoids, flavones, isoflavones, catechins, anthocyanidins, isothiocyanates, carotenoids, allyl sulfides, polyphenols. Some of the more commonly known phytochemicals include beta carotene, ascorbic acid (vitamin C), folic acid, and vitamin E.

Phytochemicals are promoted for the prevention and treatment of many health conditions, including cancer, heart disease, diabetes, obesity and high blood pressure. There is some evidence that certain phytochemicals may help prevent the formation of potential carcinogens (substances that cause cancer), block the action of carcinogens on their target organs or tissue, or act on cells to suppress cancer development. They also stimulate enzymes that help the body get rid of harmful chemicals and boost the immune system.

a) Sources

They are found in fruits, vegetable, legumes (beans and peas) and grains making them easy for most people to include in their diet. They are also available as dietary supplements. Some specific phytochemicals and their sources are shown on Table 5:

Table 5: Phytochemicals, Sources and Possible Effects

S/N	Phytochemical	Food Sources	Possible Effects
1	Alkylresorcinols (phenolic lipids)	Whole-grain wheat and rye	May contribute to the protective effect of grains in reducing the risks of diabetes, heart disease, and some cancers
2	Allicin (organosulfur compound)	Chives, garlic, leeks, onions	Antimicrobial that may reduce ulcers; may lower blood cholesterol.
3	Capsaicin	Hot peppers	Modulates blood clotting, possibly reducing the risk of fatal clots in heart and artery disease.
4	Carotenoids (include beta-carotene, lycopene, lutein and hundreds of related compounds)	Deeply pigmented fruits and vegetables (apricots, broccoli, cantaloupe, carrots, pumpkin, spinach, sweet potatoes and tomatoes)	Act as antioxidants, possibly reducing risks of cancer and other diseases
5	Curcumin	Turmeric, a yellow-colored spice.	Acts as an antioxidant and anti-inflammatory agent; may reduce blood clot formation; may inhibit enzymes that activate carcinogens.
6	Flavonoids (include beta-carotene, lycopene, lutein, and related compounds)	Berries, black tea, celery, citrus fruits, green tea.	Act as antioxidants: scavenge carcinogens; bind to nitrates in the stomach, preventing conversion to nitrosamines; inhibit cell proliferation.
7	Genistein and daidzein (isoflavones)	Food Sources: Soybeans, soy flour, soy milk, tofu, textured vegetable protein, other legume products.	Phytoestrogens that inhibit cell replication in GI tract; may reduce risk of breast, colon, ovarian, prostate, and other estrogen-sensitive cancers; may reduce cancer cell survival; may reduce risk of osteoporosis.
8	Indoles (organosulfur compound)	Cruciferous vegetables such as broccoli, brussel sprouts, cabbage, cauliflower, horseradish, mustard greens, kale	May trigger production of enzymes that block DNA damage from carcinogens; may inhibit estrogen action.
9	Isothiocyanates (organosulfur compounds that include sulforaphane)	Cruciferous vegetables such as broccoli, brussel sprouts, cabbage, cauliflower, horseradish, mustard	Act as antioxidants; inhibit enzymes that activate carcinogens; activate enzymes that detoxify carcinogens; may reduce risk of breast cancer, prostate cancer.

S/N	Phytochemical	Food Sources	Possible Effects
		green, kale.	
10	Lignans	Flaxseed and its oil, whole grains.	Phytoestrogens that block estrogen activity in cells possibly reducing the risk of cancer of the breast, colon, ovaries and prostate
11	Monoterpenes (including limonene)	Citrus fruit peels and oils.	May trigger enzyme production to detoxify carcinogens; inhibit cancer promotion and cell proliferation.
12	Phenolic Acids	Coffee beans, fruits (apples, blueberries, cherries, grapes, oranges, pears, prunes), oats, potatoes, soybeans.	May trigger enzyme production to make carcinogens water soluble, facilitating excretion.
13	Phytic Acid	Whole Grains.	Binds to minerals, preventing free-radical formation, possibly reducing cancer risk.
14	Resveratrol	Red wine, peanuts, grapes and raspberries.	Acts as antioxidant; may inhibit cancer growth; reduce inflammation, LDL oxidation, and blood clot formation.
15	Saponins (glucosides)	Alfalfa sprouts, other sprouts, green vegetables, potatoes, tomatoes.	May interfere with DNA replication, preventing cancer cells from multiplying; stimulate immune response.
16	Tannins	Black-eyed peas, grapes, lentils, red and white wine, tea.	Act as antioxidants; may inhibit carcinogen activation and cancer promotion.

b) Possible Complications

In the amounts consumed in a healthy diet, phytochemicals are unlikely to cause any problems. However, when phytochemical supplements are taken in large amounts they can have side effects, and can interact with some other drugs the individual may be taking at the same time.

3.4 Food Processing and Preservation

3.4.1 Food Processing

Food processing is defined as the transformation of basic ingredients into manufactured foods and drinks. In the broad sense of the word, food production, processing, preservation are methods of processing. The term 'processing' refers to techniques and technologies other than methods of preservation that are used by manufacturers of industrialized processed foods.

Urbanization and westernization have turned many Nigerians into consumers of processed foods, some of which are imported. Sometimes, processed foods can be expired, contaminated or adulterated but the marketers or manufactures tamper with these attributes with the view to

selling their products. These actions can cause many problems including food poisoning. Data shows that over 200,000 Nigerians die annually from food poisoning. Recent media reports indicated that these deaths were caused largely by foods contaminated through improper processing and preservation. More troubling still, some of these food items are preserved with chemicals that are injurious to human health. For example, Bisphenol-A (BPA), often used in plastics and lining of many canned goods, can cause endocrine disruption. Harmful chemicals such as BPA and Diethylstilboestrol (DES), a chemical found in cattle feed and breast cancer treatment medicine, can change how hormones operate and lead to birth defects such as neurological disorders or autism.

3.4.2 Food Preservation

Food preservation is the process of treating and handling food to stop or slow down food spoilage, loss of quality, edibility or nutritional value and thus allow for longer food storage. Preservation usually involves preventing the growth of bacteria, fungi and other micro-organisms (although some methods work by introducing benign bacteria, or fungi to the food), as well as retarding the oxidation of fats which cause rancidity. Food preservation can also include processes, which inhibit visual deterioration, such as the enzymatic browning reaction in apples after they are cut, which can occur during food preparation.

Many processes designed to preserve food will involve a number of food preservation methods. Preserving fruit by turning it into jam, for example, involves boiling (to reduce the fruit's moisture content and to kill bacteria, yeasts, etc.), sugaring (to prevent their re-growth) and sealing within an airtight jar (to prevent recontamination). There are many traditional methods of preserving food that limit the energy inputs and reduce carbon footprint. Other methods of food preservation include drying, refrigeration, freezing, vacuum packing, salting and smoking.

Maintaining or creating nutritional value, texture and flavour is an important aspect of food preservation, although, historically, some methods drastically altered the character of the food being preserved. In many cases, these changes have now come to be seen as desirable qualities – cheese, yoghurt and pickled onions being common examples.

3.4.3 Preservatives

Preservatives can be antimicrobial; which inhibit the growth of bacteria or fungi, including mould, or antioxidant; such as oxygen absorbers, which inhibit the oxidation of food constituents. Common antimicrobial preservatives include calcium propionate, sodium nitrate, sodium nitrite, sulfites (sulfur dioxide, sodium bisulfite, potassium hydrogen sulfite, etc.) and disodium EDTA. Antioxidants include butylatedhydroxyanisole (BHA) and butylatedhydroxytoluene (BHT). Other preservatives include formaldehyde (usually in solution), glutaraldehyde (kills insects), ethanol and methylchloroisothiazolinone.

3.4.4 Food Additives

Many if not most processed foods contains additives such as bulking aids, colours, flavours, solvents and many other categories which may be synthetic or natural. Some of these additives are carcinogenic. Flavours like alkenylbenzenes are groups of naturally occurring flavours, some of which have been found to cause liver cancers in rodents at levels higher than human dietary intake. About 50 colour compounds are permitted for use in foods, various azo dyes and other colours found in foods are found to be carcinogenic in experimental settings. Around 20 solvents are permitted for food use. Diechloromethane and trichloroethylene once used widely for decaffeinating coffee and tea have been classified as carcinogens to humans.

3.4.5 Options for Improving the Quality of Processed Foods

a) Developing collaborations between the food industry and governments to encourage product reformulation towards a healthier nutrient profile of processed foods
b) Creating **nutrient content standards** for selected products (e.g. high fat meat products) so that the food supply system provides healthier food choices
c) Having **mandatory product labeling** for ingredient lists and nutrition information panels to facilitate healthier choices and to encourage product reformulation.
d) Developing a **regional nutrition signposting systems** (such as healthy tick) to facilitate healthier choices and to encourage product reformulation. Collaboration with the food industry to progress this.
e) Enacting **regulations regarding misleading information** and the use of nutrient claims (e.g. 'low in fat') and health claims (e.g. 'lowers cholesterol').
f) Importers and retailers **promoting healthier food options** and increasing their availability.
g) Food producers and caterers to produce and promote **healthier portion sizes**.
h) **Increasing the availability and access to local foods**. This includes:
   i. Enhancing support for farmers, fishermen and for home production, through technical assistance, tax breaks, subsidies and other support measures
   ii. Improving access to local produce through improved and more efficient movement of local produce domestically and increased numbers of local markets

3.4.6 Recommended Preventive and Control Measures:

a) Improve personal and environmental hygiene in kitchens, storage facilities and in food and beverage industries.
b) Processed foodstuffs, especially meat, poultry, dairy products like eggs and milk should be properly stored and cooked because they are highly vulnerable to contamination.
c) Canned foods and drinks should be properly cleaned before consumption as rodents may have left some residues of droppings there.
d) Hazard Analysis Critical Control Points in food and beverage industries to ensure quality at the point of processing, preservation and consumption.

3.5 General Recommendations

The general recommendations based on the Food Based Dietary Guidelines and Infant Young Child Feeding Guideline are aimed at ensuring that the different age groups in all segments of the Nigerian population consume adequate amounts of food that contain the nutrients needed to attain and maintain good health. The recommendations also aim at reducing the growing prevalence of protein energy malnutrition (PEM) as well as diet-related non-communicable diseases.

3.5.1 Good Nutrition

No single food by itself (except breast-milk) provides all the nutrients in the right amounts that will promote growth and maintain life. To achieve good nutrition, therefore, it is necessary to consume as wide a variety of foods as possible from the age of 6 months and to take all vaccinations.

a) Infants (0 – <6 months)

i. Start exclusive breast-feeding immediately after birth and continue for 6 months.
ii. There should be no bottle-feeding.
iii. Exclusive breast-feeding means no food or water except breast milk.

b) Infants (6 – <12 months)

i. Continue breast-feeding.
ii. Introduce complementary feeds made from a variety of cereals, tubers, legumes, fruits, animal foods and give with cup and spoon.

c) Toddlers (12 – 24 months)

i. Continue to breast-feed until child is 2 years.
ii. Give enriched pap or mashed foods twice daily.
iii. Give family diet made soft with less pepper and spices.
iv. Give fruits and vegetables in season.

d) Children (25 – 60 months)

i. Give diet that contains a variety of foods in adequate amounts.
ii. Add palm oil or vegetable oil to raise the energy level of complementary foods.
iii. Gradually increase food intake to 4 – 5 times daily as baby gets older.
iv. Provide dark green leafy vegetables, yellow/orange coloured fruits, citrus fruits, cereals, legumes, tubers and foods of animal origin.
v. Limit the consumption of sugary food.
vi. Continue feeding even when child is ill.

e) School-aged Children (6 – 11 years)

i. Give diet that contains a variety of foods in adequate amounts.
ii. Encourage consumption of good quality snacks, but limit the consumption of sugary snacks.

f) Adolescents (12 – 18 years)

i. Consume diet containing a variety of foods.
ii. Most of the energy should be derived from roots/tubers, legumes, cereals, vegetables and less from animal foods.
iii. An increase in total food intake is very important at this stage, so is the need to enjoy family meals.
iv. Snacks especially pastry and carbonate drinks should not replace main meals. If you must eat out, make wise food choices.
v. Liberal consumption of whatever fruit that is in season should be encouraged.
vi. Females need to eat more iron-containing foods like meat, fish, poultry, legumes, cereals as well as citrus fruits to enhance body's use of iron.

g) Adults (male and female)

i. Total food intake should take into consideration the level of physical activity.
ii. Individuals who do manual work need to consume more food than those who do sedentary work.
iii. Limit the fat intake from animal foods.
iv. Diet should consist of as wide a variety of foods as possible e.g. cereals, legumes, roots/tubers, fruits, vegetables, fish, lean meat, local cheese (wara).
v. Limit intake of salt, bouillon cubes (seasoning cubes) and sugar.
vi. Liberal consumption of whatever fruits that is in season is encouraged.

h) Pregnant Women

i. Eat a diet that contains a variety of foods in adequate amounts.
ii. Consume enough food to ensure adequate weight gain.
iii. Eat more of cereals, legumes, fruits, vegetables, dairy products and animal foods.
iv. Take iron and folic acid supplements as prescribed.
v. Avoid alcohol, addictive substances and use of tobacco

i) Breast-feeding Mothers

i. Eat diets that contain a variety of available food items like cereals, tubers, legumes, meat, fish, milk, fruits, vegetables, etc.
ii. Eat more foods rich in iron such as liver, fish, beef, etc.
iii. Eat fruits in season at every meal.
iv. Eat green leafy vegetables liberally.
v. Drink fluids as needed to quench thirst.
vi. Avoid alcohol, addictive substances and smoking.

j) The Elderly

i. Eat diets that are prepared from a variety of available foods e.g. milk, nuts, cereals, tubers, fruits, vegetables, etc.
ii. Increase consumption of fish and other seafoods.
iii. Eat more of fruits and vegetables.
iv. Eat more frequently.

3.5.2 Physical Activity/Exercise

a) Physical activity both as short periods of intense exercise or prolonged periods of modest activity on a daily basis generally has beneficial effects.
b) Children and adolescents should engage in leisure time exercise.
c) Adults should undertake some form of exercise as recommended by their doctors.

3.5.3 Healthy Lifestyles

a) Some habits and lifestyles e.g. tobacco use and excessive alcohol consumption have been found to be bad for health.
b) Prolonged indulgence in these lifestyles predisposes to non-communicable diseases like cancers, diabetes, heart problems, and hypertension.

3.5.4 Alcohol

a) Harmful alcohol consumption can lead to risk of hypertension, liver damage, malnutrition and various cancers. There is also the problem of alcohol abuse.
b) If you must drink, take alcohol in moderation.
c) Avoid drinking alcohol when driving a vehicle or operating any machinery.

3.5.5 Tobacco

a) Tobacco use is associated with various cancers and other chronic disorders.
b) Smoking during pregnancy can harm the developing baby and can result in low birth weight babies.
c) Avoid the use of tobacco in any form.

Table 6: Recommendations of Foods for the Prevention and Management of NCDs

S/N	NCDs	Foods to Take	Foods to Reduce intake	Foods to Avoid
1	**Cardiovascular diseases**	**Fatty foods:** Low fat fish e.g. tilapia, stock- fish, lean meat, turkey/chicken without skin, snails, game (bush meat)	Fatty meat/fish such as hump (tozo), tongue, cow tail, skin, bacon sausage, hamburger, mackerel	Organ meat like liver, kidney, brain (kwanyar), intestine
		Fats/oils: Corn oil, sunflower, soya bean oil, and groundnuts/oils	Oils rich in saturated fats e.g. palm oil, coconut oil, palm kernel oil, lard, chicken fat, turkey fat, pear (ube), ogbono etc.	Egg yolk, lad (‘man shanu’)
		Dairy products: Skimmed milk, low fat, cheese and yoghurt	Full cream evaporated milk, fat, butter, cheese, condensed full cream milk, full cream powdered milk	
		Fried foods: Nil	Fried foods e.g. puff-puff, doughnut, chin-chin, etc.	
		Baked products: Nil	Baked products such as meat pie, sausage rolls, chocolate, cookies, cakes	
		Fruits: Oranges, tangerine, grapefruits		Avocado
		Soluble fibre containing foods: Cowpeas, beans, broad beans, pigeon peas etc.	Bambara nuts, groundnuts, soya beans	
		Starchy foods/cereals: Yam, cassava, plantain (green), rice, guinea corn, whole wheat, maize, millet, etc	Refined (processed) foods such as semovita, corn-vita, baking flour, spaghetti, macaroni, noodles etc.	
		Sugary foods: Nil	Refined sugars and foods: containing added sugar.	Sweetened carbonated drinks (soft drinks) jam, marmalade

S/N	NCDs	Foods to Take	Foods to Reduce intake	Foods to Avoid
		Salt: Nil	Cooking salt	Salty foods such as corned-beef, sardine, bouillon cubes and monosodium glutamate (MSG), salted fish/meat. Added of salt to cooked food at table
		Alcohol: Nil	Red wine	**Alcohol** e.g. ogogoro, palm wine, gin sherry, champagne, alcoholic wines, beer, stout, vodka, locally brewed beer, etc
		Tobacco: Nil		Tobacco in any form e.g. cigarette, cigar, pipes, snuff, chew
2	**Diabetes mellitus**	**Starchy foods:** Whole grain e.g. maize, millet, guinea corn, acha, roots/tubers e.g. water yam, Irish potatoes, bitter yam (esuru), unripe plantain.	Yam, cassava, (akpu, fufu), Sweet potatoes highly refined flour products such as semolina, cassava flour.	Ripe plantain, banana.
		Sugary foods: Fresh diluted fruit juices especially lemon/lime juice, unsweetened tea	Baked beans, tomato ketchup	Sugarcane, honey, dates (dabino), sugar cane sweets (alewa), soft drinks, ice creams, lolly pops, cocoa-based beverages, candies. Sweets marmalades jellies, chocolate bars, coffee if hypertensive.
		Vegetables: Green leafy vegetable with every meal. Fresh vegetable-based salads, squeeze-washed bitter leaves. Vegetable soup, garden eggs, cucumber as snacks. Thickened soup e.g. ukpo, achi, akparata, ofo, cowpea, pumpkin (kabewa) etc.		

S/N	NCDs	Foods to Take	Foods to Reduce intake	Foods to Avoid
		Fatty foods: Low fat fish e.g. tilapia, stockfish/cod. Lean meat e.g. turkey/chicken without skin, snails, game (bush meat).	Fatty meat/fish such as hump (tozo), tongue, cow tail, skin, bacon sausage, hamburger, mackerel.	Organ meat like liver, kidney, brain (kwanyar), intestine
		Dairy products: Skimmed milk, low fat cheese and yoghurt	Full cream evaporated milk, fat, butter, cheese, condensed full cream milk, full cream powdered milk	Butter, ice cream.
		Fats/oils: Corn oil, sunflower oil, soya bean oil, and groundnut oil, margarine.	Oils rich in saturated fats e.g. palm oil, coconut oil, perm kernel	Fats from anima sources e.g. lard, butter, chicken fat, turkey fat.
		Fruits: One or two portions of fruits a day. At least of the fruits in season once or twice a day like oranges, guava, mangoes.		Avocado pear, African pear (ube), coconut.
		Salt: Nil	Salt in cooking	Salty foods such as corned-beef, sardine, bouillon cubes and monosodium glutamate (MSG), salted fish/meat. Adding of salt to cooked food at table.
		Alcohol **tobacco:** Nil	Red wine	Alcohol smoking
3	**Overweight and obesity**	**Starchy foods:** Whole grain e.g. maize, millet, guinea corn, roots and tubers e.g. yam, cocoyam, cassava	Refined cereals and tubers such as wheat flour, cassava flour (‘elubo’), yam flour etc	Pastries such as buns, puff-puff, meat pie, cakes, etc.

S/N	NCDs	Foods to Take	Foods to Reduce intake	Foods to Avoid
		Sugary foods: Fresh unsweetened diluted fruits juices especially lemon/lime juice. unsweetened carbonated water e.g. soda water	Baked beans, tomato ketchup, canned fruits and juices	Sugarcane, honey, dates (‘dabino’), sugar cane sweets (‘alewa’), soft drinks, ice creams, lolly pops, cocoa-based beverages, candies, sweets, marmalades, jam, jellies, chocolate bars.
		Legumes/nuts: Foods containing soluble fibre such as beans, soya beans flour	Nuts such as coconut, groundnut, palm kernel nuts	
		Vegetables: More vegetables at each meal. Eat garden eggs, garden egg leaves, cucumber, carrots, fresh vegetable salad, and green vegetables including squeeze washed bitter leaves and moringa (‘zogale’) leaves		
		Fruits: One or two portions of fruits daily like oranges, grapefruits, any fruits in season		Avocado pear, African pear (ube)
		Fatty foods: Low fat fish e.g. tilapia, stockfish and sawa, lean meat, chicken/ turkey without skin, snails, game (bush meat)	Fatty meat/fish such as hump (‘tozo’), tongue, cow tail, skin, bacon sausage, hamburger, mackerel	Organ meat like liver, kidney, brain (‘kwanyar’), egg if blood cholesterol is high
		Dairy products: Skimmed milk, low fat cheese and low fat yoghurt	Full cream evaporated milk, condensed milk including local cheese (‘wara’), full cream powdered milk.	Animal fat butter
		Fats/oils: Corn oil, sunflower oil, soya bean oil, and groundnut oil, margarine	Oils rich in saturated fats e.g. palm oil, coconut oil, perm kernel	Fats from anima sources e.g. chicken, turkey, lards, and butter
		Alcohol/tobacco: Nil		Drinking alcohol, using tobacco

4.0. Policies, Legislations and Coordination

4.1 Policy

Policy means consensus among relevant partners on issues to be addressed and on the approaches or strategies to use in doing so. The NCDs control programme could stimulate action on policy at the national level and, through the exchange of experience, facilitate the attempts of various states of the Federation to implement preventive policies.

One of the targets for health for all should address the development of healthy public policy, in recognition of the fact that policies emanating from sectors other than health can have a profound influence on people's lifestyle choices and health. The objective of healthy public policy – called for at the WHO international health promotion conferences in Ottawa in 1986, Adelaide in 1988, and Sundsvall in 1991 – is to secure social and institutional consensus on supportive action outside the health domain and explicitly to recognize health and equity in all areas of public policy. The NCDs Control Programme has numerous opportunities to work with various partners on advocacy approaches and to review the impact of their national and local policies on health.

Policy options include preventive actions at primary, secondary, and tertiary levels. Primary prevention aims to prevent exposure to the risk factors that cause disease. These may include policies that promote anti-smoking, encourage physical activity, promote a healthy diet, and reduce harmful use of alcohol. Secondary prevention strategies attempt to diagnose and treat an existing disease in its early stages before it results in significant morbidity. Policy options to be considered at the secondary level of care include adopting new care models such as Disease Monitoring Programmes (DMPs) and integrated care models, strengthening the surveillance on NCDs, and using information and communications technology such as electronic patient records and clinical decision support systems. Tertiary prevention aims to reduce the negative impact of an established disease by restoring function and reducing disease-related complications. Activities at this level would focus on the avoidance of complications and preventing disease progression.

4.2 Policy Options

Reducing the risk factors through policy interventions, legislation and regulations is needed to control tobacco and alcohol production and use, and reduce trans-fat and salt intake by working with manufacturers and the food-production industry to ensure healthy food supply. Women and men are exposed to risk factors to a different degree. Men are more likely to use tobacco and consume alcohol in excess while women are more likely to be obese due to hormonal changes and genetic makeup. Health promotion programs need to target gender-specific risk factors using tested methodologies. Adopt a multisectoral approach to NCD prevention and control by involving line ministries, civil society organizations and the private sector.

4.3 Recommendations

Based on the policy options stated above, the following are recommended;

a) The policy aim shall be to reduce the impact of marketing of foods high in saturated fats, trans-fatty acids, free sugars, or salt on children.

b) Governments shall set clear definitions for the key components of the policy, thereby allowing for a standard implementation process. The setting of clear definitions would facilitate uniform implementation, irrespective of the implementing body.

c) Neighbouring and other countries shall be made to cooperate to put in place the means necessary to reduce the impact of cross-border marketing (in-flowing and out-flowing) of foods high in saturated fats, trans-fatty acids, free sugars, or salt in order to achieve the highest possible impact of this policy.

d) The policy framework should specify enforcement mechanisms and establish systems for their implementation. In this respect, the framework should include clear definitions of sanctions and could include a system for reporting complaints.

e) All policy frameworks shall include a monitoring system to ensure compliance with the objectives set out in the national policy, using clearly defined indicators. Evaluation of the policy should use specific indicators that evaluate the effect of the policy on its overall aim

f) Increasing the availability and access to local foods by enhancing support for farmers, fishermen and for home production, through technical assistance, tax breaks, subsidies and other support measures. This also include improving access to local produce through improved and more efficient movement of local produce domestically and increased numbers of local markets.

g) Improving the quality of processed and other foods by developing collaborations between the food industry and governments to encourage product reformulation towards a healthier nutrient profile of processed foods.

h) There shall be creation of nutrient content standards for selected products (e.g. processed and unprocessed meat products, margarines) to ensure that the food environment provides healthier food choices.

i) There shall be mandatory product labeling with ingredient lists and nutrition information panels to facilitate healthier choices and to encourage product reformulation.

j) Enacting regulations against misleading information on the use of nutrient claims (e.g. ‘low in fat’) and health claims (e.g. ‘cholesterol free’, ‘lowers cholesterol’).

k) Modifying the pricing structure through:

i. Reviewing the existing price control regulations, and amending them if necessary to remove less healthy items and to include healthier products.
ii. Reviewing the existing VAT exemption lists and amending them if necessary to ensure that the tax system supports healthy food choices.
iii. Reviewing the existing import tariff structure and making amendments to ensure minimal tariffs are applied to healthier products and the maximum allowable rates are applied to less healthy items such as high-sugar items, unhealthy fats and products rich in transfats.
iv. Reviewing the concessions on taxes for domestic food processors and amending them to ensure that they do not facilitate lower prices for less healthy products.
v. Using targeted taxes on less healthy products to fund health promotion activities or to support lowered taxes (or other support) on healthier items

l) Implementing settings-based policies. This includes:

i. Implementing healthy food service policies for government departments and agencies (to cover all meetings and workshop catering).
ii. Implementing school food policies: including restrictions on sales and promotion of less healthy items and education.
iii. Implementing industry policies that limit the sales of soft drinks and other less healthy items in school settings.
iv. Promoting food policies for all workplaces

m) Enhancing the promotion of healthier foods and limiting the marketing of unhealthy foods through:

i. Industry codes of practice on advertising and sponsorship of less healthy foods and drinks to children.
ii. Enacting regulations to reduce the marketing of less healthy foods to children (includes restrictions on advertising, sponsorship, internet, interactive games, competitions etc that are linked to less healthy food products and related brands). Regional approach would provide benefit.
iii. Developing, implementing and regularly reviewing food-based dietary guidelines.
iv. Reviewing school curricula to ensure that they adequately cover healthy eating and that they complement the school food policies.
v. Encouraging workplace-based health education programmes to complement the food policies.
vi. Implementing social marketing, education and awareness programs to support policy interventions

5.0. Nutritional Management of NCDs

5.1 Overweight and Obesity

Overweight and obesity are defined as "abnormal weight or excessive fat accumulation that presents a risk to health" (WHO).

Central obesity is defined as a waist circumference of ≥102cm for males, ≥88cm for females and/or BMI ≥25kg/m^2 for both genders.
Body Mass Index (BMI) is defined as the weight of an individual in kilograms (kg) divided by his or her height in square metre (m^2).

$$\text{BMI} = \frac{\text{Weight (kg)}}{\text{Height (m) x Height (m)}} = \frac{\text{Weight (kg)}}{\text{Height (m}^2\text{)}}$$

For example if an individual's weight is 60kg and height is 1.5 meters, the BMI is thus calculated as follows;

$$\text{BMI} = \frac{60\text{kg}}{1.5\text{m x } 1.5\text{m}} = \frac{60\text{kg}}{2.25\text{m}^2} = 26.67\text{kg/m}^2$$

Table 7: BMI Interpretation

BMI (kg/m^2)	Interpretation
<18.5	Underweight
18.5 – 24.9	Normal
25.0 – 29.9	Overweight (Grade 1 overweight)
30.0 – 39.9	Obese (Grade 2 overweight)
>40	Extremely obese (Grade 3 overweight)

It is difficult to develop one simple index for the measurement of overweight and obesity in children and adolescents because their bodies undergo a number of physiological changes as they grow. Depending on the age, different methods to measure a body's healthy weight are available.

5.1.1 Classification of Childhood Obesity:

BMI is acceptable for determining obesity for children two years of age and older. The normal range for BMI in children varies with age and sex.

The Centre for Diseases Prevention and Control defines obesity as a BMI greater than or equal to the 95th percentile. It has published tables for determining this in children. If a child was malnourished in early childhood, he or she is more likely to become overweight later in life.

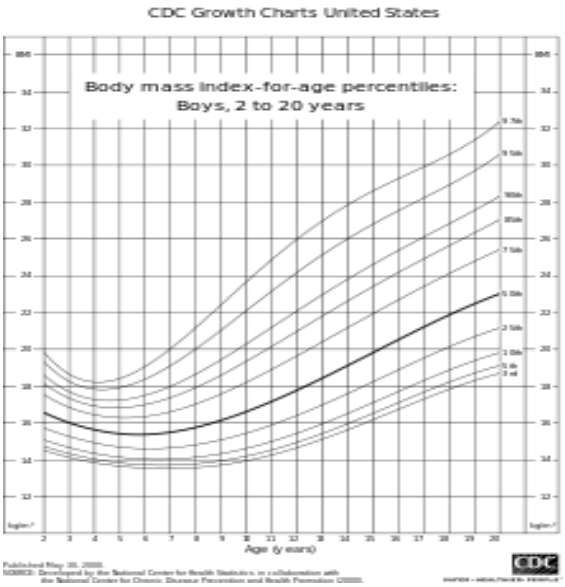

Figure 17: Growth Chart for Boys

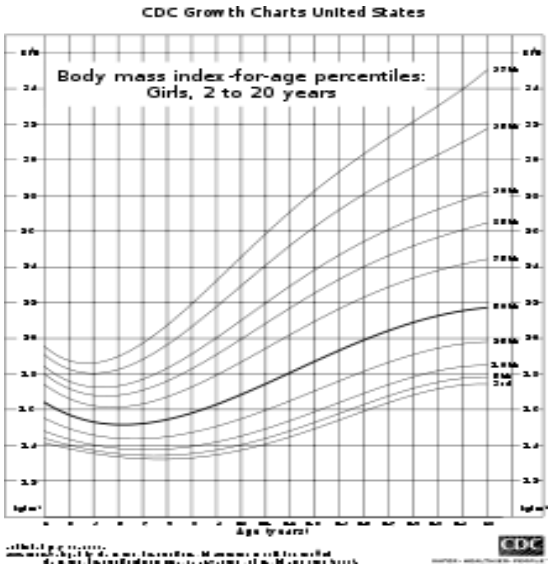

Figure 18: Growth Chart for Girls

5.1.2 Complications of Obesity

When a person is overweight, he or she is more likely to develop dietary related non-communicable diseases such as:

a) High blood pressure
b) High cholesterol
c) Type 2 diabetes mellitus
d) Coronary heart disease
e) Stroke
f) Gallstones and other digestive disorders
g) Arthritis of the knees and hip joints
h) Some cancers
i) Respiratory problems
j) Backache problems
k) Ulcers and
l) Gout

These disorders may result in premature deaths or disability. Overweight children may become overweight adults.

5.1.3 Recommendations for Preventing Overweight

The following practices are recommended to prevent overweight and obesity:

a) Eat meals with plenty of fruits and vegetables. These contain lots of fibre, which reduces food energy intake, provides satiety and delays hunger.
b) Eat snacks that are low in energy such as fruits, vegetables, legumes and whole grain foods.

c) Take regular exercises such as walking fast (hurriedly) or uphill, digging, jogging, pounding, playing games such as traditional dancing e.g. bata and atilogu dance, local wrestling, football, netball, swimming, squash, volleyball, and tennis.
d) Reduce the intake of fatty foods. These are high in energy per gram.
e) Avoid high energy foods such as fizzy drinks, beverages (chocolate drinks), chips, crisps, noodles, pastas, sweets and cakes, dodo, cheese etc.
f) Avoid excess consumption of alcohol.
g) Avoid late supper after 7.30pm

5.1.4 Nutritional Management of Overweight:

If a person is already overweight, the guidelines below will help to reduce weight and associated risks if they are all followed.

a) Reduce the amount of food taken per meal to minimize energy intake.
b) Take regular but small meals.
c) Reduce fat intake, which has the most energy per gram.
d) Increase the intake of fruits and vegetables to reduce calorie intake.
e) Increase physical activity.
f) Avoid excessive consumption of alcohol.
g) Avoid late supper.

5.1.5 Recommendations for Preventing Obesity:

The following practices are also recommended to prevent obesity:

a) Prevent becoming overweight by following the recommendations stated under overweight.
b) Maintain normal body weight with BMI below 25.0 kg/m^2
c) If you are overweight with BMI 25.0 – 29.9 kg/m^2 reduce weight by:
   i. Eating meals with plenty of fruits and vegetables;
   ii. Eating snacks that are low in energy such as fruits, vegetables, legumes and timed e.g. mid-day and mid-evening;
   iii. Engaging in regular and vigorous exercises as in overweight with the help of a specialist who will check your heart condition before commencing the regime;
   iv. Reducing intake of fatty foods;
   v. Avoid high energy foods such as fizzy drinks, beverages (Chocolate drinks), chips, crisps, sweets and cakes;
   vi. Stop taking alcohol completely.

5.1.6 Nutritional Management of Obesity:

Obese people should follow the guidelines below in order to reduce excess weight and associated disorders and conditions.

a) Eat a variety of low energy foods from the six food groups every day.
b) Eat unrefined foods such as local rice, local garri, amala, tuwon shinkafa made from local rice etc instead of imported polished rice, semovita/semolina, refined wheat. Eat whole grain bread instead of white bread.

c) Eat legumes such as beans, cow peas, ground beans.
d) Reduce the intake of oil rich nuts such as groundnuts, soya and cashew nuts.
e) Eat low fat animal foods such as meat without fat, white meat such as chicken, low fat or skimmed milk, lean fish (panla, agbodo) Reduce the intake of fatty foods including fat rich animal foods such as cheese, fatty beef, fatty pork, organ meat (orisirisi, cow leg etc), full cream milk etc.
f) Timed snacking with snacks that are low in energy such as fruits, vegetables, legumes e.g. mid-day and mid-evening;
g) Eat regular small meals and avoid late supper
h) Eat plenty of vegetables at each meal.
i) Eat plenty of fruits at each meal.
j) Eat small regular meals to avoid feeling very hungry and avoid eating too much food.
k) Cook meals using methods that do not use fats such as roasting, grilling, boiling and steaming.

Table 8: Sample of Daily Menus for Reducing Weight

Breakfast	Mid-morning	Mid-day meal	Mid-Afternoon	Evening Meal
A medium size fruit or a glass of unsweetened fresh fruit juice (orange, mango, peach, pineapple, water melon, pawpaw, tomato, guava and others) + 1 egg (boiled, scrambled or poached). + ½ cup porridge/oat with skimmed milk or 20g unsweetened breakfast cereal + 1-2 slices of brown bread or 1 medium size sweet potato, Irish potato, yam or cassava	1 cup Skimmed milk (no sugar)	3 serving spoon of rice + 1 piece thigh or leg or half breast or whole wing (maximum quarter) of chicken OR Medium size fish and one small plate vegetables + A medium fruit from the recommended list.	1 cup Skimmed milk or 100% fruit juice	½ cup juice from fresh fruits such as pineapple, orange, guava, mango, pawpaw and pineapples among others or medium size fresh fruit + ½ cup cooked beans or meat with no fat + Salad or boiled vegetables + 2 medium size boiled Irish potatoes + Skimmed milk (no sugar)

5.2 Hypertension

Hypertension is blood pressure higher than normal. Hypertension is a major disorder, belonging to the group of disorders of the heart and blood vessels known as cardiovascular diseases. Other groups of disorders include coronary heart disease (heart attack), cerebrovascular disease (stroke), peripheral vascular disease, heart failure, rheumatic heart disease, congenital heart disease and cardiomyopathies. These entities are major contributors of the NCDs. They are promoted by risk factors like tobacco use, alcohol, physical inactivity and unhealthy diet.

It is estimated that nearly one billion people are affected by hypertension worldwide, and this figure is predicted to increase to 1.5 billion by 2025. According to various studies, the prevalence of hypertension ranges between 10% and 20% in Nigeria. A survey by the expert committee on non-communicable diseases in Nigeria revealed the prevalence of hypertension in adult Nigerians aged 15 years and above, after adjusting to the cut-off point of 140/90 mmHg, to be 17% and 20% respectively in rural and urban communities.

5.2.1 Definition

Hypertension (or high blood pressure) means high pressure (tension) in the arteries. Arteries are vessels that carry blood from the pumping heart to all the tissues and organs of the body. Hypertension is a chronic medical condition which can be classified as either primary (essential) or secondary. About 90 – 95% of the cases are termed 'primary hypertension' in which no medical cause can be found. The remaining 5 – 10% of cases (secondary hypertension) is caused by conditions that affect the kidneys, arteries, heart or the endocrine system.

Persistent and uncontrolled hypertension is one of the risk factors for stroke (brain damage), heart attack, hardening of the arteries (atherosclerosis or arteriosclerosis), heart failure and arterial aneurysm, eye damage and is also a leading cause of kidney failure. These complications of hypertensions are often referred to as end-organ damage because damage to these organs is the end result of chronic (long duration) high blood pressure. Moderate elevation of arterial blood pressure leads to shortened life expectancy.

Dietary and lifestyle changes as well as medicines can improve blood pressure control and decrease the risk of associated health complications.

5.2.2 Classification

Blood pressure (BP) is classified either based on Joint Network Classification (JNC 7) or WHO/International Society for Hypertension (ISH).

Table 9: Classification of Hypertension

JNC 7 Classification			
Category	**Systolic BP (mmHg)**		**Diastolic BP (mmHg)**
Normal	<120	&	<80
Pre-hypertension	120 – 139	or	80 – 89
Stage 1 hypertension	140 – 159	or	90 – 99
Stage 2 hypertension	>160	or	>100
WHO/ISH 1999 Classification			
Category	**Systolic BP (mmHg)**		**Diastolic BP (mmHg)**
Optimal	<120		<80
Normal	<130		<85
High normal	130 – 139	or	85 – 89
Grade 1 hypertension	140 – 159		90 – 99
Grade 2 hypertension	160 – 179		100 – 109
Grade 3 hypertension	>180		>110
Isolated systolic hypertension	>140	&	<90
Borderline	140	&	90

Based on aetiology, hypertension is classified into essential (primary) or nonessential (secondary) hypertension. The cause of essential hypertension is multi-factorial, i.e. due to interplay of several factors. In secondary hypertension, which accounts for 5% of hypertension, the high blood pressure is secondary to or caused by a specific abnormality in one of the organs or systems of the body.

Factors that increase the risk of developing essential hypertension include sedentary life style (i.e. lack of exercise), stress, visceral (abdominal) obesity, potassium deficiency (hypokalaemia), obesity (>85% of cases occur in those with a BMI >25 kg/m^2), overuse of salt, alcohol intake, and vitamin D deficiency. Risk also increases with aging, some inherited genetic mutations, and having a family history of hypertension. An elevation of rennin, an enzyme secreted by the kidney, is another risk factor, as is sympathetic nervous system over activity. Insulin resistance, which is a component of a metabolic syndrome, is also thought to contribute to hypertension. Recent studies have implicated low birth weight as a risk factor for adult essential hypertension. Approximately 30% of cases of essential hypertension are attributable to genetic factors. In addition, in individuals who have one or two parents with hypertension, high blood pressure is twice as common as in the general population.

Uncomplicated hypertension usually occurs without any symptoms (silently) and so has been labeled the "silent killer". This is because the disease can progress to any one or more of the potentially fatal complications such as heart attack or stroke.

5.2.3 Prevention and Management of Hypertension

Since hypertension is associated with several conditions including stroke (brain damage), heart attack, hardening of the arteries (atherosclerosis or arteriosclerosis), heart failure and arterial aneurysm, eye damage and is also a leading cause of kidney failure. A person with hypertension should observe the following guidelines in order to prevent and manage the condition:

a) Repeated measurements of blood pressure are taken to provide the most accurate assessment of blood pressure levels.

b) Following this, lifestyle changes are recommended to lower blood pressure, before the initiation of prescription of drug therapy if need be.

c) The following are the suggested lifestyle changes and dietary modification in dietary management of hypertension:

i. Weight reduction and regular aerobic exercises e.g. walking. Regular exercise improves blood flow and helps to reduce the resting heart rate and blood pressure.
ii. Reduce dietary sugar intake. Take complex carbohydrates such as whole grain meal like sorghum, acha, Guinea corn etc and whole wheat bread among others
iii. Reduce the intake of saturated fats, animal fat and caffeine (caffeine is found in tea, coffee and energy drinks)
iv. Increase the intake of fruits and vegetables in your diet.
v. Maintain a normal BMI (18.5– 24.9 kg/m^2).
vi. Reduce salt in the diet and avoid adding salt to already cooked food. This step decreases blood pressure in about 33% of people.
vii. Use the **D**ietary **A**pproaches to **S**top **H**ypertension (DASH diet), which is rich in fruits and vegetables and low fat or fat-free dairy products. In addition, an increase in dietary potassium, which offsets the effect of sodium, has been shown to be highly effective in reducing blood pressure.
viii. Discontinue tobacco use and harmful alcohol intake has been shown to lower blood pressure.
ix. Abstain from tobacco use reduces the risk of stroke and heart attack, which are associated with hypertension.
x. Reduce stress, for example with relaxation techniques, by reducing environmental stress such as high sound levels and over illumination can also lower blood pressure.

5.2.4 Guidelines for Patients Self-Management

a) Learn the role of good nutrition in the context of hypertension control.
b) Read food labels. This will help to avoid excessive intake of sodium, fat and sugar in the diet.
c) Prevent stressful situations such as overworking.
d) Monitor or have your blood pressure checked regularly
e) Develop the habit of using low salt diet through the use of flavours, aromas like garlic, tasty spices, tomato, and ginger when preparing meals.
f) Avoid using cooking methods that retain a lot of fats and oils in the food such as frying and stewing.
g) Follow the doctor's prescription when on medication.

Table 10: Sample of Daily Menu for People with Hypertension: Combination

Breakfast	Mid-day meal	Evening meal	Bedtime
Skimmed Milk OR Fruit or fresh unsweetened fruit juice OR Decaffeinated coffee, milo, cocoa, tea with skimmed milk, or soya milk, or lemon glass and chidede tea + Low-salt cereal like whole meal porridge (Akamu/Pap) OR Low sodium bread or toast with low fat margarine or jelly or marmalade + 1 egg (unsalted - boiled, steamed or scrambled)	Fruit or fresh unsweetened fruit juice & Tuwon shinkafa, amala, eba, pounded yam or tuwo made from maize and one part skinned soya bean or millet or sorghum OR Potato, cassava, green plantains/bananas, rice, and pasta (cooked without salt). + Unsalted fatless meat, poultry or fish (tilapia, stock –fish, lean meat, turkey/chicken without skin) which may be grilled or boiled or roasted. + Fresh or preserved vegetables (ugwu, spinach, ewedu, zogale (*Moringa olifera)* etc	Fruit or fresh unsweetened or 100% fruit juice + Unsalted fatless meat or egg, poultry or grasshoppers (Farra), caterpillars, termites, which may be grilled, boiled or roasted. + Fresh vegetable salad without cream OR Beans, peas, cow peas, OR Low sodium bread + Decaffeinated coffee, milo, cocoa, tea with skimmed milk. or soya milk	Cultured milk such as Yoghurt OR Juices from mango, apple, Guava, papaya (pawpaw)

5.3 Cardiovascular Diseases: Ischaemic Heart Disease

Cardiovascular diseases (CVD) including hypertension are the leading causes of morbidity and mortality both in developed and developing countries. Developing countries, including Nigeria, are undergoing epidemiological transition and at the moment suffer double burden of disease i.e. both communicable and NCDs. Over the last two decades, adaptation of western lifestyles including diets has increased the incidence of CVDs like ischaemic heart disease (IHD) in Nigeria. Other nutritionally relevant CVDs include stroke and peripheral vascular disease.

Anecdotal reports from various centres in Nigeria have shown that IHD is increasingly prevalent in Nigeria. Nutrition has an important role in the management of ischemic heart disease because atherosclerosis is the primary cause of ischemic heart disease, also called coronary artery disease. Atherosclerotic disease can occur in vessels of other organs of the body. It results from the formation of atheroma which contains a lipid core layer surrounded by smooth muscles, monocytes and macrophages and covered by fibrous cap which forms the plaque. The plaque grows over time and narrows the blood vessels limiting blood flow and causing ischaemia.

The morbidity and mortality associated with coronary artery disease is strongly related to abnormal lipid levels, oxidation of lipids and intra-arterial clot formation. Nutrition powerfully influences each of these factors. There is growing evidence that patients can improve lipid levels and decrease the rate of cardiovascular events by "adding" specific foods to their diets and switching from saturated and polyunsaturated to monounsaturated fats and n-3 fatty acids.

Appropriate dietary changes decrease arteriosclerotic plaque formation, improve vascular blood flow, reduce oxidation of low-density lipoproteins and enhance thrombolytic activity. Changes in diet can prevent the prevalence and reduce the premature mortality and morbidity associated with coronary artery disease.

5.3.1 Dietary Recommendations for Prevention and Management of Cardiovascular Diseases

The following are the suggested lifestyle changes and dietary modification in dietary management of cardiovascular disease:

a) Weight reduction and regular aerobic exercises e.g. walking, regular exercise improves blood flow and helps to reduce the resting heart rate and blood pressure.

b) Reduce dietary sugar intake. Take complex carbohydrates such as whole grain meal like sorghum, acha, Guinea corn etc and brown bread among others

c) Reduce the intake of saturated fats, animal fat and caffeine (caffeine is found in tea and coffee)

d) Increase the intake of fruits and vegetables in your diet.

e) Maintain a normal BMI which is only attained when your body weight is within the standards limits (18.5– 24.9 kg/m^2).

f) Reducing sodium (salt) in the diet. This step decreases blood pressure in about 33% of people.

g) Using the Dietary Approaches to Stop Hypertension (DASH), which is rich in fruits and vegetables and low-fat or fat-free dairy products. In addition, an increase in dietary potassium, which offsets the effect of sodium, has been shown to be highly effective in reducing blood pressure.

h) Discontinuing tobacco use and alcohol consumption has been shown to lower blood pressure.

i) Abstaining from cigarette smoking reduces the risk of stroke and heart attack, which are associated with hypertension.

j) Reducing stress, for example with relaxation techniques, by reducing environmental stress such as high sound levels and over illumination can also lower blood pressure.

5.4 Diabetes mellitus

Diabetes mellitus (DM) is a chronic metabolic disorder of multiple causes characterized by chronic hyperglycemia (high blood sugar) with disturbances of carbohydrate, fat and protein metabolism, resulting from defects in insulin secretion, insulin action or both.

Medical Nutrition Therapy (MNT) is important in preventing diabetes, managing existing diabetes, and preventing, or at least slowing, the rate of development of diabetes complications. It is, therefore, important at all levels of diabetes prevention. MNT is also an integral component of diabetes self-management education. This guideline provides evidence-based recommendations and interventions for diabetes MNT.

The goal of these recommendations is to make people with diabetes and health care providers aware of beneficial nutrition interventions. This requires the use of the best available scientific evidence while taking into account treatment goals, strategies to attain such goals, and changes individuals with diabetes are willing and able to make. Achieving nutrition-related goals requires a coordinated team effort that includes the person with diabetes and involves him or her in the decision-making process. It is recommended that a registered dietitian, knowledgeable and skilled in MNT, be the team member who plays the leading role in providing nutrition care. However, it is important that all team members, including physicians and nurses, be knowledgeable about MNT and support its implementation.

Dietary control plays a role in any of the three ways currently used in the management of diabetes, which are as follows: - Diet alone, Diet and oral anti-diabetic agents, and diet and insulin.

5.4.1 Goals of MNT for Prevention and Treatment of DM

a) Goals of MNT that apply to individuals at risk for diabetes or with pre-diabetes:
   i. To decrease the risk of diabetes and cardiovascular disease (CVD) by promoting healthy food choices.
   ii. To promote physical activity leading to moderate weight loss that is maintained.

b) Goals of MNT that apply to individuals with diabetes:
   i. Achieve and maintain blood glucose levels in the normal range or as close to normal as is safely possible.
   ii. Achieve and maintain a lipid and lipoprotein profile that reduces the risk for vascular disease.
   iii. Achieve and maintain blood pressure levels in the normal range or as close to normal as is safely possible.

c) To prevent or at least slow the rate of development of the chronic complications of diabetes by modifying nutrient intake and lifestyle.

d) To address individual nutrition needs, taking into account personal and cultural preferences and willingness to change.

e) To maintain the pleasure of eating by only limiting food choices when indicated by scientific evidence.

5.4.2 Effectiveness of MNT: Recommendations

a) Individuals who have pre-diabetes or diabetes should receive individualized MNT; a registered dietician familiar with the components of diabetes MNT best provides such therapy.
b) Nutrition counseling should be sensitive to the personal needs, willingness to change, and ability to make changes of the individual with pre-diabetes or diabetes.

5.4.3 Nutritional Recommendations and Interventions for the Prevention of Diabetes (Primary Prevention)

a) Among individuals at high risk for developing type 2 DM, structured programs that emphasize lifestyle changes that include moderate weight loss (7% body weight) and regular physical activity (150 min/week), with dietary strategies including reduced calories and reduced intake of dietary fat, can reduce the risk for developing diabetes and are therefore recommended.

b) Low–glycaemic index foods that are rich in fiber and other important nutrients are to be encouraged.

c) No nutrition recommendation can be made for preventing type 1 DM.

d) The importance of preventing type 2 diabetes is highlighted by the substantial worldwide increase in the prevalence of diabetes in recent years. Lifestyles changes characterized by increased energy intake and decreased physical activity appear to have together promoted overweight and obesity, which are strong risk factors for diabetes.

e) Although selected micronutrients may affect glucose and insulin metabolism, to date, there are no convincing data that document their role in the development of diabetes.

f) About diabetes mellitus in youth: No nutrition recommendations can be made for the prevention of type 1 DM at this time. Increasing overweight and obesity in youth appears to be related to the increased prevalence of type 2 diabetes, particularly in adolescents. Lifestyle changes including reduced energy intake and regular physical activity are likely to be beneficial for the youth and are therefore recommended.

5.4.4 Recommendations for Control and Prevention of DM

a) Have a well-defined, timely and regular pattern for eating, working, recreation, exercise and sleep.
b) Where the diet is failing, administer drugs to treat and prevent complications of diabetes.
c) Reduce obesity by improving body weight because obesity insulin resistance. Follow recommendations for reducing weight as given in the section for overweight and obesity.
d) Eat lots of fibre (unrefined food products) from foods such as whole grain cereals, legumes like soya beans, root crops, fruits and vegetables. These foods slow down digestion and absorption of sugars.
e) Eat more of boiled or roasted foods other than fried foods.
f) Use less gravy and fats since these contribute to obesity, which is a risk factor for diabetes.
g) Eat frequently, in small or modest amounts.
h) Avoid eating too much in one goal and going for longer periods without eating.
i) Avoid harmful alcohol intake
j) Go to the hospital regularly for check-up.
k) Exercise regularly to avoid becoming overweight and obese.
l) An individual with impaired glucose tolerance should begin diet therapy on diabetes.

5.4.5 Nutritional Management of Type 1 DM

In order to manage diabetes mellitus, an individual should observe the following recommendations:

a) Take regular medical check-up to detect any changes in the blood sugar level.
b) Follow nutrition therapy explained in the control and prevention of diabetes in order to maintain blood glucose level. Be consistent on the intake of carbohydrates: 15 - 30grams complex carbohydrate such as green bananas, whole cereals (acha, wheat), whole wheat bread
c) Do not take concentrated sweets in the diet
d) Take adequate but not excessive proteins.
e) Use non-fat milk (e.g. nono), meat and unsaturated fats (fats from plant origin) in moderation in the diet.
f) Restrict salt intake to one teaspoon per day (to ease blood movement in the vessels).
g) Take at least a fruit a day. These provide minerals and natural sugar and 100% fruit juices if feasible.
h) Eat as much vegetables as possible for vitamins and minerals especially green and red. Examples are ugwu, aleyehu, water leaf, carrots, tomato and onions among others.
i) Avoid alcohol completely because it increases the blood sugars
j) Eat meals consistently from day to day to improve glucose control
k) Take precaution when engaging in physical activities. An individual who has mild hyperglycaemia they may experience a fall in blood glucose during exercises.
l) Refrain from vigorous physical activities
m) Eat before, during and after physical activity especially carbohydrates, readily available fruits such as apples, and bananas, fruit juices, yoghurt, crackers and other starches like cassava or sweet potatoes
n) Eat an evening snack to help sustain the blood glucose through the night

5.4.6 Nutritional Management of Type 2 DM

a) Take carbohydrates consistently throughout the day. Too much carbohydrates at once can raise blood glucose and too little can lead to hypoglycaemia
b) Reduce fat intake because it increases insulin resistance.
c) Use non-fat milk, meat and unsaturated fats mainly from plant origin in moderation in the diet like soya, maize and olive oils and shea butter oil.
d) Restrict salt intake to one teaspoon per day (to ease blood movement in the vessels).
e) Take at least a fruit a day like mango, guava, oranges, pawpaw, and watermelon. These provide minerals and natural sugar.
f) Eat as much vegetables as possible for vitamins and minerals especially green and red.
g) Avoid alcohol completely because it increases the blood sugars.
h) Eat meals consistently from day to day to improve glucose control.
i) Control weight loss and gain to avoid other complications that come due to the increase or reduction in weight.

j) Avoid alcohol completely because it increases the blood sugars.
k) Take low impact aerobic activities such as walking for 20 – 30 minutes at least 3 times a week. The exercise improves blood glucose control and blood lipid levels, contributes to weight loss and lowers blood pressure.

5.4.7 Other Dietary Recommendations:

A person with diabetes is not prevented from eating any of the following foods: skimmed milk, roasted low fat meat, fresh fruit or vegetable juice, diabetic fruit squash, soup, seasonings, spices and low carbohydrate vegetables and fruits. However, an individual with DM should eat the following foods in moderation: meats, fish, cheese, eggs, butter, margarine, cream and vegetable oils. Completely avoid sugar, glucose, sweets, chocolate, syrup, jam, marmalade, cakes, biscuits (except those specifically prepared for diabetic individuals), pies, fruit tinned in syrup, fruit squash, lemonade or similar aerated drinks.

Personal daily energy requirements for people with diabetes depends on the patient's needs determined by, age, sex ,actual weight in relation to desirable weight, occupation and physical activities. It is recommended that for most diabetic diets the proportion of energy from carbohydrate should be 50 – 55%, from protein should be 10-15% and from fat should be <35%.

Table 11: Sample of Foods and their Nutrient Content for People with DM

Starch	Fruits	Milk	Vegetable	Meat	Fats
¼ to ½ cup cereal, grain (akamu, acha, soghum), pasta **OR** ½ - 1 cup baked beans, green peas, mixed vegetables with corn, peas **OR** 1-2 slices of whole wheat bread. These serving portions above are equivalent to 15g carbohydrate, 3g protein, 0 – 1g fat and 80 kcal.	½ small to medium fresh fruit **OR** ½ -1 cup canned or fresh fruit juice **OR** ¼ cup dried fruit These serving portions above are equivalent to 15g carbohydrate and 60kcal	**i) Skimmed Milk** 1/3 cup skimmed dry milk **OR** ½ - 1 cup fresh milk. These serving portions are equivalent to 12g carbohydrate, 8g protein, 0 – 3g fat, 90kcal **ii) Low-fat milk** ¾ - 1 cup fresh milk These serving portions are equivalent to 12g carbohydrate, 8g protein, 5g fat, 120 kcal. **iii) Whole milk** ½ -1 cup This is equivalent to 12g carbohydrate, 8g protein, 8g fat, 150 kcal.	½ cup of cooked vegetables or vegetable juice **OR** 1 cup raw vegetables These are equivalent to 5g carbohydrate, 2g protein, and 25 kcal.	**i) Fatless meat** 28.35g (1 oz) of poultry (white meat, no skin), fish (fresh or frozen or canned in water), shellfish, game or eggs. These serving are equivalent to 7g protein, 0-1g fat, 35kcal **ii) Meat with less fat** 28.35g (1 oz) of beef, lamb, liver, heart (high in cholesterol) poultry (dark meat, no skin), chicken white meat with skin, 6 medium oysters, 2 medium sardines. This is equivalent to 7g protein, 3g fat and 55 kcal. **iii) Medium fat meat** 28.35g (1 oz) beef (most beef products), poultry, fish (any fried fish product), pork (top loin), lamb (rib roast), 1 cup soya milk. These are equivalent to 7g proteins, 5g fat, 75kcal iv) High fat meat 28.35g (1 oz) of pork (e.g. pork sausages), cheese (all regular), 3 slices bacon, 2 tablespoons peanut butter (contains unsaturated fat) These are equivalent to 7g protein, 8g fat, 100 kcal	**i) Monounsaturated Fats** 28.35g (1 oz) avocado, 1 teaspoon oil, 2 teaspoon peanut butter (smooth or crunchy). **ii) Polyunsaturated Fats** 1 teaspoon margarine, mayonnaise (regular) **iii) Saturated Fats** 1 slice bacon (Cooked), 2 teaspoon butter (whipped), 1 teaspoon butter (reduced fat) 3 tablespoons sour cream (reduced fat) These are equivalent to 5g fat, 45 kcal. Consumption of saturated fats can raise blood cholesterol levels in people with diabetes.

5.4.8 Calculation of Total Daily Calories Needs:

This depends on age, sex, weight, and amount of activity. Thus, a young growing active child requires more calories than an old sedentary individual does. Male, active and underweight requires more calories than female, inactive and overweight. The sedentary overweight patient would require 20 – 25 Cal/kg/day. The underweight with marked activity would require 50 – 54 Cal/kg/day. As a rule of Thumb, a child requires 1000 Calories/day plus 100 Calories for every additional year of age. The patient's Basal calorie requirement can also be calculated using the **"Harris and Benedicts"** formula as follows:

The Harris Benedict Equation for Basal Energy Expenditure (BEE) which is often used to estimate the minimum amount of energy needed by the body at rest (basal energy), uses age, height and weight.

BMR for men (kcals/day) = 66.5 + (13.75 x weight) + (5.003 x height) – (6.775 x age)

BMR for women (kcals/day) = 655.1 + (9.563 x weight) + (1.850 x height) – (4.676 x age)

Where: weight in kilogram; height in centimeters; and age in years

Another method for estimating energy needs is calculation of Resting Energy Expenditure (REE).

REE for men (kcals/day) = 1.0 x weight in kg x 24

REE for women (kcals/day) = 0.95 x weight in kg x 24

BEE and REE are multiplied by an activity factor to estimate total energy expenditure.

Table 12: Energy Needs based on Weight and Activity Level (kcal/kg/day)

	Sedentary	**Moderate**	**Active**
Overweight	20 – 25	30	35
Normal weight	30	35	40
Underweight	30	40	45 – 50

Example: A 75 kg male who is 1.8 m tall doing moderate level activity would require how much energy daily?

$$\text{BMI} = \frac{75\text{kg}}{1.8\text{m x } 1.8\text{m}} = \frac{75\text{kg}}{3.24\text{m}^2} = 23.15\ \text{kg/m}^2$$

This person is in the normal weight range and since he is doing moderate activity then according to the table above:

His daily energy requirements = Energy multiplier (taken from table above) x weight

His daily energy requirements = 35 x 75weight = **2,625 kcals/day**

Table 13: Sample Menu for People with Diabetes Mellitus

Breakfast	Mid-morning	Lunch	Mid-afternoon	Dinner	Bed time
2 slices of brown bread with 1 teaspoon butter **OR** 4 – 6 balls of small akara (kosai) **OR** 2 slices of boiled yam and fish soup **OR** 1 cup/wrap moi-moi with akamu + ¾ cup skimmed fresh milk **OR** Tea or coffee (no sugar)	2 pieces crackers **OR** 4 balls of kuli-kuli **OR** Tea with milk (no sugar)	½ cup of rice + ½ cup of beans **OR** 1 average handful amala or acha or tuwo + 30g of fatless meat or beans + Vegetables (from permitted list) + Fresh fruit juice	1 glass of zobo **OR** Kunun acha **OR** Skimmed milk (no sugar)	1 cup of rice or ½ roasted or boiled unripe plantain + 1 chicken thigh (remove skin) or 3 table spoons fingerlings + Vegetables from the permitted list + 1 glass of water	1 slice of whole wheat bread **OR** 2 pieces of crackers **OR** 1 piece of banana **OR** ½ cup skimmed milk

5.5 Cancers

Cancers are diseases that result from abnormal uncoordinated, excessive growth of cells. The World Health Organization (WHO) has identified cancer as one of the major health problems confronting humankind in this century.

Over 10 million new cases and over 7 million deaths from cancer occurred worldwide in 2000. The developing countries contributed 53% for incidence and 56% for deaths. Between 2000 and 2020, the total number of cases of cancer in the developed world is predicted to increase by 29%, whereas in developing countries an increase of 73% is expected. This is largely as a result of an increase in the number of old people and as a result of urbanization and change in dietary habits.

The three most common cancers in Nigeria are cancer of the breast, closely followed by cancer of the cervix and cancer of the prostate. The figure below shows the prevalence of cancers in Nigeria.

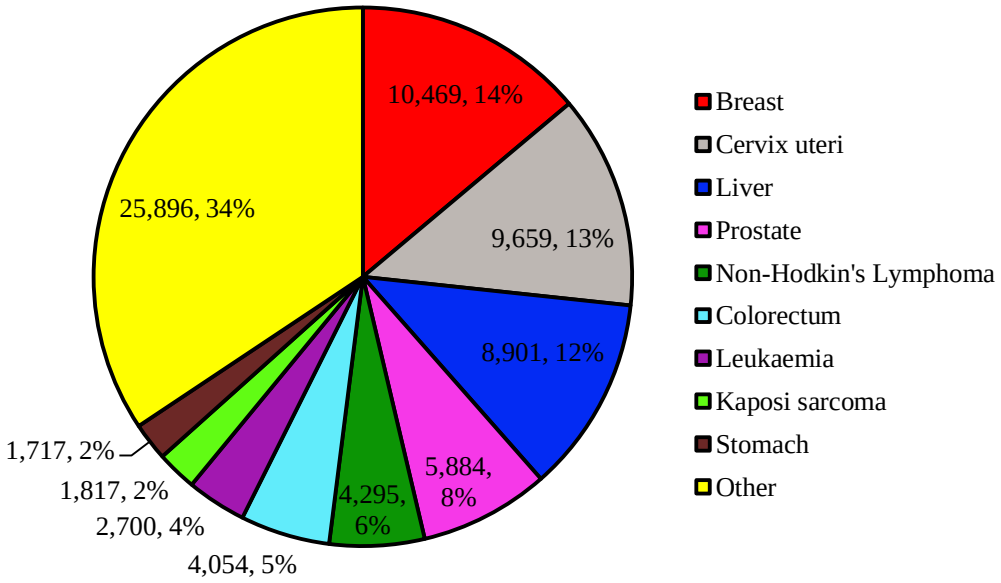

Figure 19: Estimated Mortality from Cancers in Nigeria- Both Gender, All Ages of Cancer Deaths, All Ages (Total: 75,392) [GLOBOCAN, 2008 (IARC)]

There are many types of cancers, with different characteristics and they occur in different locations in the body such as breasts, liver, lungs, ovaries, stomach, bladder and the skin among others.

Cancer is caused by different factors and requires different treatments. As the abnormal mass of cells grows, blood vessels are formed to supply the tumour with nutrients it requires to support its growth. Eventually, the tumour invades normal (healthy) tissues and may spread.

Clinicians describe cancers by their size and extent, specifically if the tumour has spread to surrounding lymph nodes or to distant sites in the body. However, this guideline dwells essentially on dietary related cancers.

5.5.1 Dietary Related Cancers

It is estimated that diet may be responsible for a third or more of all cancer cases. Stomach cancers are high in parts of the world where people eat a lot of heavily smoked, pickled or salt cured foods that produce carcinogens.

Alcohol is also associated with cancer of the mouth, bladder and liver just to mention a few. Fats eaten in excess may promote cancer in part by contributing to obesity.

Examples of dietary related cancers include:

a) Oesophageal cancer
b) Stomach or colon cancer
c) Colorectal cancer
d) Liver cancer
e) Breast cancer
f) Cervical cancer
g) Bladder cancer
h) Prostate cancer

5.5.2 Risk Factors of Cancer

There are several factors that put an individual at a higher risk of developing cancer. These include:

a) Harmful alcohol use
b) Tobacco use
c) High use of preserved foods e.g. tinned food
d) High intake of salt-preserved foods such as dried salted fish
e) Low intake of fruits and vegetables
f) High intake of fat particularly saturated fat
g) Obesity
h) Genetic make-up
i) Aging which affects immune function
j) Iron overload
k) Foliate deficiency
l) Artificial sweeteners
m) Red meat (regular eaters at higher risk)
n) Lack of physical activity

5.5.3 Nutritional Recommendations for Prevention and Management of Cancers

If the client feels too weak, high energy foods may assist to boost the levels such as 1 tea spoon of plumpy nut/ground nut paste once a day in severe weight loss may help.

a) Take a lot of fruits and vegetables especially green (spinach, pumpkin leaves-ugu, ewedu, okazi, bitter leave, water leave etc, and yellow (mango, carrot, dika nut, pawpaw etc) ones.
b) Take a lot of water per day, it helps to remove waste products (2-3liters/day)
c) Control weight and obesity (avoid becoming overweight or obese)
d) Reduce the consumption of total saturated fats (fatty beef, lamb, goat, pork, chicken skin, beef offals-intestines etc)
e) Increase fibre intake per day from whole grain foods like maize, local rice, millet, acha, sorghum, brown bread etc.
f) Minimize the consumption of salt cured, salt-pickled, and smoked foods
g) Reduce alcoholic beverages
h) Vary food choices.

Table 14: Foods to be Taken, Limited or Avoided by Cancer Patients

Foods to be taken by Cancer Patient	Foods to be Limited/avoided by Cancer patient
Vegetable, fruit, Brown Rice, Legumes, Nuts and Seeds, Fish, Lemon water, Coconut Milk, Beverages	Meat, Dairy Products, Wheat and other Gluten Contain grains, Oats, Sugar, Potatoes and Sweet potatoes, Yam, Fried Food, Dietary Supplement and Food Additives

Table 15: Sample of Daily Menu of Foodstuffs for Meals for People with Cancer

Breakfast	Mid-day meal	Evening meal	Bedtime
Fruits and vegetables especially green and yellow ones such as pawpaws, mangoes, bananas, citrus fruits and also natural fresh or 100% fruit juices. **OR** Whole grain cereal such as sorghum, millet, acha, local rice and maize served as pudding or porridge (e.g. maize porridge, soya porridge etc) or in 'tuwo' form (e.g. tuwon shinkafa, tuwon masara) **OR** Whole wheat bread **OR** Coffee, or milo, or cocoa, or tea (lemon grass and green/black tea) without milk.	Fruit or natural fresh fruit juice. **OR** Pulses (legumes; beans, bambara nuts, pigeon pea). **OR** Potatoes, garri and other cassava products, green bananas, rice, plantains. **+** Fatless meat, chicken without skin and all other types of poultry without skin. **+** Fresh or preserved vegetables spinach (amaranths species), ugu (pumpkin leaves), sweet potato leaves or salad without cream	Fruit or natural fresh fruit juice **OR** Egg, or chicken without skin, or bush meat, or grass hoppers, or caterpillars, or flying termites, or lean beef or goat meat etc **OR** Fresh vegetable salad without cream **OR** Beans, or peas, or pigeon peas, or other legumes. **OR** Green bananas/plantain with a glass of skimmed milk.	A cup of natural fresh fruit juice or tea without milk and sugar.

5.6 Gout

Gout, a painful form of arthritis, has long been associated with diet, particularly over indulgence in meat, seafood and alcohol. As a result, gout treatment used to include severe dietary restrictions, which made compliance with gout diet difficult. Fortunately, newer medications to treat gout have reduced the need for such a strict diet. Gout occurs when high levels of uric acid in the blood cause crystals to form and accumulate around a joint. The body produces uric acid when it breaks down purines. Purines occur naturally in the body, but they can also be obtained from eating certain foods, such as organ meats, salt-water fish, asparagus, and mushrooms.

Newer diet recommendations similar to a healthy-eating plan are recommended for most people with gout. Besides helping to maintain a healthy weight and avoid several chronic diseases, this diet may contribute to better overall management of your gout. A gout diet helps to control the production and elimination of uric acid, which may help prevent gout attacks or reduce their severity. The diet is not a treatment for gout, but may help control the attacks. Obesity also is a risk factor for gout, so losing weight can help lower the risk of attacks.

5.6.1 Nutritional Recommendations for Prevention and Management of Gout

a) Avoid purine rich foods to reduce purine load of the body such as red meat, liver, kidneys, sardines, fish and meat extracts.
b) If overweight and having gout reduce weight gradually – use the recommendation in this document.
c) Reduce intake of saturated fat. It lowers the body's ability to eliminate uric acid. . High-fat meals also contribute to obesity, which is linked to gout
d) Choose plant-based protein, such as beans and legumes, and low-fat or fat-free dairy products.
e) Drink lots of fluid especially water up to 3 litres per day to dissolve and wash away the uric acid crystals.
f) Use bicarbonate of soda to increase the solubility of uric acid in urine in order to prevent precipitation of urate crystals.
g) Seek medical treatment for prescription of drugs, which either reduce synthesis of uric acid or increase excretion of urinary uric acid
h) Avoid alcohol or excessive alcohol intake
i) Avoid beverages sweetened with high-fructose corn syrup, such as soft drinks or juice drinks. Juices that are 100 percent fruit juice do not seem to stimulate uric acid production as much
j) Take a glass of water before going to bed or Coffee and tea. Caffeine is not converted into uric acid in the body.

Table 16: Sample of Daily Menu of Foodstuffs for Meals of People with Gout

Breakfast	Lunch	Dinner	Bed time
Fruit or natural fresh fruit juice **OR** Cereal (e.g. akamu, oats, corn flakes, or sorghum) **OR** Toasted Bread with butter or low fat margarine; or jelly or marmalade **OR** Soya coffee, milo, tea without milk **OR** Lemon grass and Tea	Fruit or natural fresh fruit juice **OR** Lean meat, eggs, or chicken and all other types of poultry (in moderate amounts) **+** Rice or Pasta or Beans or Garri or tubers like yam, potato **+** Fresh or preserved vegetables or salad **OR** Skim or low-fat milk	Fruit or natural fresh fruit juice **OR** Egg, or chicken (roasted or baked), or non salt-water fish **OR** Fresh vegetable salad **OR** Beans, or amala or tuwo **OR** Nonalcoholic beverage, such as water or tea	A cup of black coffee or tea

5.7 Sickle Cell Disorder (SCD)

Sickle Cell Disease is a genetic (hereditary) disorder that occurs when an individual has inherited two mutant (abnormal) haemoglobin (Hb) genes from both parents, at least one of which is HbS and the resulting symptoms and signs are due to abnormality in the shape of red blood cells. In sickle cell disease, red blood cells are deformed (taken the shape of "sickle"), rigid and fragile and by reason of this being unable to sufficiently carry out their normal functions, notably oxygen delivery. Over 40 million Nigerians are healthy carriers of the Sickle Cell gene.

5.7.1 Nutritional Requirements for SCD

a) Fluids

It is crucial for people living with SCD to drink plenty of water. Water help prevent stickiness of blood in SCD, thereby keeping the red blood cells from sickling. People living with SCD should get at least the normal amount of eight glasses of water a day, but when the weather is hot, they need more in order to stay completely hydrated.

b) Supplements

People Living with Sickle Cell Disease (PLWSCD) should get extra folic acid on a daily basis, whether through a supplement or food that is rich in it. This can be gotten from green leafy vegetables like spinach, fruits, grains or nuts. It aids in the production of red blood cells.

c) Caloric Intake

The average energy intake of sickle cell patients is typically below the suggested allowance for calories during the quiescent phase (steady state) of the disease, and it drops to roughly half the recommended levels during times of illness requiring hospitalization. Standard nutritional assessment methods used to calculate energy needs typically underestimate resting energy expenditure in persons with SCD.

A careful nutritional assessment and the addition of energy supplements are therefore indicated. These calories should come from healthier snacks such as string cheese or other dairy products, peanut butter, nuts and lots of fruits and vegetables.

d) Fibre

PLWSCD need more fibre in the diet which can be gotten from grains and nuts, whole grain breads, fruits and veggies. Juice is also another great way to add fibre to diets.

e) Omega-3 fatty acid supplements

The serum phospholipids of people with SCD contain reduced proportions of both the parent (alpha-linolenic acid) and the long-chain omega-3 polyunsaturated fatty acids (eicosapentanoic acid, EPA, and docosahexanoic acid, DHA), compared with healthy individuals. Long-chain omega-3 fatty acids (EPA/DHA) increase the fluidity of red blood cell membranes, whose lack

characterizes sickle cell crisis. Therefore a supplement of Omega-3 fatty acid is required by these individuals. This could be gotten cheaply from walnuts, oily fish such as salmon, mackerel and cod liver oil.

f) Iron

Recent reports from India and Nigeria, describe low iron stores in the bone marrow of 36% – 67% of the patients studied. Therefore, there may be a need for iron supplement in the management of SCD patients during the steady state after careful assessments.

g) Micronutrient status may need correction

Blood levels of several vitamins and minerals are often low in individuals with SCD, including vitamin A and carotenoids, vitamin B6, vitamin C, vitamin E, magnesium, and zinc. These deficiencies cause a significant depreciation in blood-antioxidant status in these individuals and the resulting oxidative stress may precipitate vaso-occlusion-related acute chest syndrome. Therefore, healthy nutrition with lots of fruits and vegetables to get adequate amount of these micronutrients that are very rich in antioxidants is preferred to taking drug supplements. Antioxidants can reduce the percentage of irreversibly sickled cells. For example, vitamin C from citrus, yellow maize for selenium etc. (Refer to tables 1, 2, 3 and 5 for sources antioxidants).

Considerations: Vitamin B-12 as well as an African diet is necessary for individuals with SCD, to help relieve symptoms of SCD. Foods rich in thiocyanate, such as yams, cassava, buckwheat, cabbage, carrots and lima beans, are highly recommended.

5.7.2 General Recommendations

a) To prevent or reduce the severity of long-term complications in PLWSCD, a number of precautions may be helpful. These include:
b) Having regular physical examinations every 3 - 6 months.
c) Having periodic and careful eye examinations.
d) Sufficient rest, warmth, and increased fluid intake (these are critical precautions for reducing oxygen loss and the risk for dehydration).
e) Avoid conditions, such as crowds, that increase risk for infections.
f) Avoid excessive demands on the body that would increase oxygen needs (physical overexertion, stress). Low impact exercise (leg lifts, light weights) may be useful and safe for maintaining strength, particularly in the legs and hips, but patients should consult their doctor about any exercise program.
g) Avoiding high altitudes if possible and if flying is necessary, be sure that the airline can provide oxygen.
h) Do not smoke, and avoid exposure to second-hand smoke.
i) Alcohol intake must be avoided.
j) Drink lots of fluid especially water up to 3 litres per day for adults.

k) Take lots of fruits and vegetables especially green (spinach, pumpkin leaves-ugu, ewedu, okazi, bitter leave, water leave etc, and yellow (mango, carrot, dika nut, pawpaw etc) ones. This will ensure adequate intake of the micronutrients.

5.8 Mental Health

The human brain has high energy and nutrient needs. Changes in energy or nutrient intake can alter both brain chemistry and the functioning of nerves in the brain. Intake of energy and several different nutrients affect levels of chemicals in the brain called neurotransmitters that transmit nerve impulses from one nerve cell to another. Deficiencies or excesses of certain vitamins or minerals can damage nerves in the brain, causing changes in memory, limiting problem-solving ability, and impairing brain function.

Several nutritional factors can influence mental health, including overall energy intake, intake of the energy-containing nutrients (proteins, carbohydrates, and fats), alcohol intake, and intake of vitamins and minerals. Often deficiencies of multiple nutrients rather than a single nutrient are responsible for changes in brain functioning.

5.8.1 Nutritional Recommendations in Mental Health Disorder

a) **Carbohydrates:** Eat carbohydrates with low glycaemic index, which include fruits, vegetables, and legumes such as beans, pasta, brown rice, basmati rice, whole meal bread and potatoes.

Figure 20: Food guide pyramid for mental health

b) Fats: Omega-3 fatty acids keep us mentally stable and therefore may be tried as supplements in people who suffer from mood problems and schizophrenia. They may help prevent relapse in bipolar disorder. However, there is no enough evidence to recommend them as an alternative to antidepressants or mood-stabilizers.Omega-3 fatty acids can be found in oily fish such as cod, salmon and mackerel. They can also be founds in plant sources such as flaxseed and walnuts. Fats are also good sources of ketones

required in ketogenic diet therapy for epilepsy. This special diet encourages the creation of ketones in the body and has been shown to reduce seizure activity. However, the ketogenic diet has been linked to specific nutrient deficiencies that must be addressed through aggressive supplementation.

c) Fluid Intake: Many patients with mental health problems always feel thirsty and this could be as a result of their medications leading to a dry mouth. Therefore individuals with mental health disorder require adequate fluid intake. However drinks can have a lot of calories too; low calorie choices include water, tea and coffee (without sugar), skimmed milk (in moderation),"light" diet soft drinks. However, alcohol, sugar-sweetened fizzy drinks, juices and smoothies must be avoided. Whole fruit rather than fruit juice is recommended.

d) Micronutrients and Supplements: Supplements are not a substitute for a healthy balanced diet. If supplement is taken do not exceed the recommended daily intake regarded as safe. If beta-carotene is being taken as supplements, smoking must be avoided since the combination may increase risk of cancer.

e) Antioxidants: Most processes in the body require oxygen but it could also damage body cells through oxidation. Antioxidants are substances that neutralize such harmful effects and that of other substances. Antioxidants are contained in many vitamins such as vitamin A, C and E and some trace elements such as selenium. They are contained in many fruits and vegetables such as oranges, strawberries, spinach, tomatoes, carrots and broccoli just to name a few. Green tea is another good source of antioxidants. Selenium can be found in pasta, bread, eggs, poultry, beef and some fish such as cod.

f) **Calcium:** Calcium is important to keep bones and teeth healthy. This is particularly important in people with mental health problems because some medications increase the risk of osteoporosis. Calcium may also be helpful to prevent or alleviate premenstrual stress. Good sources of calcium include milk, dairy products and fish such as sardines where the bones are eaten. However, calcium can only work if it is combined with vitamin D. Good sources of vitamin D include oily fish, some cereals and eggs. Exposure to sunlight is also a good way for vitamin D production.

5.8.2 General Dietary Recommendations for Mental Health Disorder:

a) Base diet on starchy foods, such as potatoes, cereals, pasta, rice, couscous and bread
b) Five portions of fruit and vegetables
c) Meat, poultry, fish, eggs, nuts and pulses as good sources of proteins
d) Milk and dairy products as a good source of protein and calcium
e) Take at least two portions of fish a week
f) Cut down on saturated fat and sugar
g) Take less salt (no more than 6 grams a day for adults and children >11 years).
h) Processed foods must be avoided as much as possible.

5.8.3 Tips to eating well in mental health disorder:

a) Avoid ready meals and take-aways. They are often rich in fat and sugars.
b) Avoid snacks such as crisps and ice creams.
c) Take fresh fruits and vegetables liberally
d) Take meats in small amounts.
e) Avoid canned foods if possible.
f) Avoid sugar-sweetened fizzy drinks and fruit juices.

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