NATIONAL OPEN UNIVERSITY OF NIGERIA

NSC 215

Nutrition in Health and Diseases

Module 1

NSC 215 (Nutrition in Health and Diseases) Module 1

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Module 1 Nutrition and Its Historical Perspective

Unit 1 Introduction to Nutrition

1.0 Introduction

Since you have gone through the Course Guide, you would have had an overview of what this unit is all about, how it links specifically to the course. This unit intends to expose you to nutrition as a science as well as an art; components of food and common terminologies in nutrition. The unit will round up with Homo sapiens nutritional behaviour before and after agricultural and industrial revolutions.

The effects of such revolution on the health of Homo sapiens shall also be examined. Prior to improving your knowledge in nutrition, it is important that we should learn in this unit the objectives as listed below.

2.0 Objectives

At the end of this unit, you should be able to:

- define nutrition and at least three other relevant nutritional terminologies
- describe nutrition as a science as well as an art
- list at least three examples of an adequate diet
- list at least three differences between the nutritional behaviours of Homo sapiens before and after agricultural revolution.

Now that you have gone through the objectives, let us begin to expatiate on some of the key terminologies used by the experts in the field.

3.0 Main Content

3.1 Definition of Nutrition and other Common Terminologies in Nutrition

Nutrition is defined as the study of food composition and its effects on the body. It can also be defined as an art and science of nourishing the body. Nutrition can be described as a science because it can be proven in animals or human beings. Deficiency of riboflavin (Vitamin B2) for example, leads to angular stomatitis (inflammation of the mouth). Excessive intake of fatty foods can lead to overweight or obesity. Nutrition is also an art because the way the food is presented to the consumer may either be appealing or unappealing regardless of its nutritious values. Food is an edible substance that human being or animals eat or drinks that supply all the nutrients that will sustain maintain and promote life and growth.

For example beans, maize, milk, fruit. Nutrients are chemical components of food that supply nourishment to the body. Examples are protein, fats, vitamins, minerals, water and carbohydrates. Micronutrients are the very small molecules that are also part of food composition that are needed in small quantities in the body but very important for good health. Examples of micronutrients are iodine, zinc, iron, vitamin A, selenium and others.

Adequate diet is a diet that contains all the essential nutrients taking in the right proportion at a sitting.

In our own community, an adequate diet is one that contains at least one food item from all the food groups e.g. carbohydrate, protein, fats & oil, etc. Malnutrition simply means bad nutrition. Bad nutrition can be classified as under or over nutrition.

Food value refers to the quality and quantity of essential nutrients that each food contains that will promote and rehabilitate good health.

Food security is defined as the availability of food-stuffs in enough quantity and quality to every member of the household regardless of age, sex, religion, and individual condition.

Nutrition security is the utilization of the food nutrients in the body system in order to restore, maintain and promote quality and healthful life.

3.2 Description of an Adequate Diet

We have read in unit 3.1, that an adequate diet is essential for optimal freedom from both infectious and non-infectious diseases. An adequate diet does not have to be expensive. Locally available foodstuffs can be easily used to plan an adequate diet. For examples, yam + beans + leafy green vegetables +crayfish and any fruit in season; Rice + beans + green leafy vegetables + frozen fish + any fruit in season; Boiled plantain + beans + piece of meat + leafy green vegetables + any fruit in season.

3.3 The Ancestral Human Nutritional Behaviour before and after Agricultural and Industrial Revolutions

In an attempt to understand the present modern dietary behaviours of Homo sapiens, it is very important to examine our ancestor's diet behaviour, 100,000 generations of our people were hunter-gatherers before agricultural revolution. Their main sources of carbohydrates, fats and protein were from fruits, vegetables, nuts and wild animals. Their consumption of fiber was very high due to eating over one hundred different fruits and vegetables. Their consumption of salt was very low and that of potassium was very high. These two nutrients have been identified as the eatiology and prevention of cardiovascular diseases. The consumption of omega-3 fatty acids was higher than omega – 6 fatty acids. These essential fatty acids have been implicated in the aetiology and prevention of cancer and cardiovascular diseases. 'Of necessity, the ratio of meat and fruits/vegetables varied with geographical location, climate and season'.

Five hundred generations have depended on agriculture. The invention of digging tools led to introduction of root, tuber and bulbs to their diets. The Homo sapiens were domesticated to produce milk and protein. Large amounts of grains, milk and protein were

consumed and they became more sedentary. Whereas, drinking of milk was rarely drank beyond infants.

The Homo-sapiens dietary behaviours have definitely changed our evolutionary diet due to agricultural and industrial revolution. Ten thousand generations have lived since the start of the industrial age. The industrial revolution has led to refining the grains into flour, processing of animal protein, thereby adding additives, salts and fats and oils to preserve the processed foods. The industrial revolution has also led to establishment of plethora of fast food restaurants. The industrial revolution has brought a drastic shift from diets high in fruits and vegetables, lean meat, and sea food to highly processed foods high in sodium and hydrogenated fats and low in dietary fibre.

3.4 Effects of Agricultural and Industrial Revolutions on Homo sapiens' Health

Over the past 100 years, the dietary behaviour of Homo sapiens has changed tremendously due to agricultural and industrial revolutions. These two revolutions have some adverse effects on human health. These adverse effects include:

- increased consumption of highly processed and refined grain- based carbohydrates which may lead to increase in type ii diabetes mellitus.
- increased consumption of refined sugar (sucrose) which was never part of our ancestors' diet. this also could lead to increase in type ii diabetes mellitus.
- the increased usage of pesticides and fertilisers may result to reduced nutritional quality of the foodstuffs.
- the high increase of domestic animals and refined grains may lead to higher increase of omega 6 than omega-3 fatty acids which may lead to increase in cardiovascular diseases and cancer.
- reduced consumption of fruits and vegetables and excess consumption of processed refined grains which may lead to constipation and colon cancer.

4.0 Conclusion

In this unit you have learnt the importance of nutrition to the achievement of quality health. You have also learnt some common terminologies in nutrition. More importantly, you have also learnt how nutrition is a science as well as an art. The unit has also discussed the homo sapiens nutritional behaviours before and after agricultural and industrial revolutions. The rapid change of our ancestors' diets to high refined processed grains coated with salt and sugar, very low fruits and vegetable and its consequences on health are also elucidated in the unit.

At this point, you should be able to define nutrition and some common terminologies in nutrition. In fact, you should be able to demonstrate that nutrition is a science and not fad and also give two examples of adequate diets using our locally available foodstuffs. In a nutshell, you should be able to describe changes in our ancestors' diet.

5.0 Summary

This unit being an introduction has defined some key definitions in nutrition and brought out the importance of nutrition in the maintenance, restoration, and promotion of quality health. The unit has also illustrated nutritional historical perspective of homo sapiens, in terms of drastic changes in nutritional behaviour before and after agricultural and industrial revolutions over the past 100 years. Unit two will further give insight to other historical aspects of nutrition.

6.0 Self-Accessement Exercise

1. In your own words, define the terms nutrition, food, and micronutrients.
2. List the main differences between our ancestors' diet and the modern ones.

7.0 References/Further Reading

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Unit 2 Notable Names in the Beginning of the Study of Nutrition

1.0 Introduction

Since you have gone through unit 1, you would have had an overview of what nutrition is all about in attaining quality health from the womb to old age. This unit will help you to acquire basic understanding of man's endeavours to investigate the mysteries of nourishing the body from the ancient times, those men and women who were the pioneers and the importance of their contributions to human nutrition.

2.0 Objectives

At the end of this unit, you should be able to:

- list at least five notable names in the beginning of the study of nutrition.
- identify the major contribution of at least three of the notable names listed above
- describe the importance of at least two contributors to present nutrition study.

3.0 Main Content

3.1 Notable Names in the Study of Nutrition

It is important that you should know that men and women that started the study of nutrition were physicians (medical doctors), engineers, biologists, philosophers, artists, physiologists, chemists and scientists. You will be exposed to prominent contributors. The list is large, you are just going to be given some of the names.

The names include Atwater, D.D., Black J; Bernard, C, Boyle; Davidson and Passmore; Goldberg, Hippocrates, Hopkins, F.C., Lavoisier, A.L., Liebig, B.J., Lind, Magendle, F; Mayo, J, McCarrison, R; Mulder , G,J., Ohlson, M, Orr, J.B., Priestly, J., Proat, W; Reaumar, Sallanzani, Sanctorius, Sherman, H.C., Tokaki, Leonando da Vinci; and Vot, C.,

3.2 Major Contributions of Notable Men and Women

- Atwater, W.D – Prepared the first food composition tables.
- Bernard, C., discovered glycogen (animal starch) and also proclaimed the pancreatic juice that is necessary for the absorption of fats.
- Davidson and Passmore identified thiamine to be responsible for beri-beri.
- Goldberg associated pellagra disease with population subsisting mainly on corn.
- Hippocrates known as the 'father of medicine' was the first to show that children consumed more food than adults. He also prophesied that 'those that are naturally very fat are apt to die earlier than those who are slender".

- Hopkins, F.C. identified certain food substances that when absent could lead to certain diseases such as rickets and scurvy.
- Lavoisier, AL - known as 'father of nutrition demonstrated that the food that was eaten was like a fuel in the body and that the more a man worked, the more food needed.
- Liebig B.J – taught that fats and carbohydrates were fuel foods and later called nutrients that formed body tissue during growth.
- Liud was the first to conduct controlled clinical trials on the reason for fresh fruits and vegetables would cure scurvy.
- Magendle F. – demonstrated that food containing nitrogen was essential to life.
- Mayow proved that when air was breathed in it was taken up by blood and transported to the part of the body.
- McCarrison R. reported that the well being and stature of people were attributed to their diets.
- Mulder GJ – identified the nitrogen content in food to be protein meaning 'to take first place'.
- Ohlson, M. – Reported study on western women aged 30 to 70 years showing that those who drank more milk and ate more eggs, vegetables and whole grain cereals and bread were in good health than those who had chronic diseases.
- Orr, JB – reported similar study when studying various tribes in Africa - He noted that greater vigour and stature were associated with a diet that contained meat and milk in contrast to diet mainly on cereals and other plant food sources.
- Prestley J – Conducted studies that discovered the gas called oxygen.
- Prout W. – He was the first to classify food into three groups, foods of animal origin, foods of a vegetable origin and a group of fatty or oily foods.
- Reaumar, R. – Demonstrated that stomach did not grind food, but rather it produced chemical that affect the food.
- Spallanzani – Investigated digestion of food in the stomach and the function of the gastric juice.
- Sanctorius – experimented with himself to detect all that happened to food consumed by weighing everything he ate, drank and also everything that came out of him.
- Sherman - He provided quantitative knowledge of nutritional requirements for man.
- Takaki - He proposed addition of milk and vegetables to wipe off beri-beri among the sailors.
- Vinci, Le – Made statements about nutrition that had a modern connotation.
- Voit C – He was the first person to work on nitrogen balance studies using dogs as experimental animals. He demonstrated the use of protein to build and maintain tissue.

3.3 The Importance of these Contributions to Human Nutrition

These great men and women laid the foundation for the modern human nutrition. Identifications of essential nutrients in food and their usefulness to support and maintain life

actually laid the foundation for further investigation as to nutrient deficiencies and infectious diseases. The modern human nutrition experts have applied the works of these notable men and women to examine the connection between diets and noncommunicable diseases such as type II diabetes mellitus, cancer, cardiovascular disease obesity, and other diseases.

4.0 Conclusion

In this unit, you have been introduced to notable names in the field of nutrition. You have also noticed that the majority of these men and women were physicians, biologists, physiologists, chemists or philosophers. The unit has also expatiated the contributions of these notable personalities to the field of nutrition. Their major contributions include identification of chemicals in the air and nutrient deficiencies in human being.

With these points you should be able to identify the professionals of the early researchers in the field of nutrition. You should be able to list at least ten notable names in the study of nutrition at the beginning. You should also be able to link the contributions of these distinguished personalities to the present study of nutrition.

5.0 Summary

This unit being a follow up of unit 1 has highlighted the notable names in the beginning of the study of nutrition. The unit has identified the key contributions of these notable men and women. The unit has also discussed the significance of these contributions to modern study of nutrition.

6.0 Self-Assessment Exercise

1. List 4 notable names in study of nutrition and their contributions.
2. What are the linkages between the early pioneers of nutrition to the present dietary behaviour?

7.0 References /Further Reading

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Unit 3 Focus of Nutrition Research in Early Century till Present

1.0 Introduction

Since you have gone through unit 2, you should have acquired general knowledge of notable names in nutrition and their contributions. This unit will help you to acquire basic knowledge as to the trend of research endeavour in human nutrition from the early century till present.

2.0 Objectives

At the end of this unit, you should be able to:

- identify at least two major foci of research works in nutrition in the early century
- describe the primary focus of nutrition research in the first half of 20th century
- list at least three major nutrient deficiencies chronic diseases being research foci in the 20th century till date.

3.0 Main Content

3.1 Focus of Nutrition Research in Early Century

The early pioneers in nutrition as illustrated in Unit 2, focused on chemical investigation in the air, studies on respiration, the importance of food as fuel to children and adults' good health, classification of foods, identification of protein in foods and discovery of glycogen (animal starch).

3.2 Focus of Nutrition Research in the First Half of 20th Century

This era witnessed researches in human nutrition that focused on the role of essential nutrients, especially vitamins in human deficiency diseases. It was after the Second World War that research in nutrition in industrial countries began to focus on the role of diet in noncommunicable diseases such as diabetes mellitus, cancer and cardiovascular diseases. The century has witnessed a plethora of information on diet and its implication with noncommunicable diseases but such information is devoid of guidance on methods of differentiating facts from fallacy.

3.3 Focus of Nutrition Research in 20th Century till Present

This century has witnessed a significant shift in the direction of nutrition research from nutrient deficiency diseases as the major causes of morbidity and mortality to investigating the role of diet in the maintenance of health and reduction of the risk of non-communicable diseases (NCCDs). Presently, the research challenges of identifying dietary factors that predispose man to specific NCCD and to explain such connection of the diseases dietary habits. In fact, researches on the effects of supplementary antioxidants (vitamin A, C, and D,

Selenium) and other phytochemicals in the management and prevention of non-communicable diseases, such as cancer, cardiovascular diseases and type II diabetes mellitus are the current focus of nutrition research.

3.4 The Usefulness of Nutrition Research

It is important to understand the usefulness of research in nutrition for the following reasons: It

- helps to understand the important nutrients in food that prevent deficiencies.
- assists to pinpoint the major nutrients that may be involved in the aetiology of obesity, cancer and cardiovascular diseases.
- provides guidelines aimed at reducing the risk of one or more noncommunicable diseases (NCCDs).
- gives an insight as to the role of diet in NCCDs.
- helps to develop step by step evaluation of scientific evidence relating to dietary composition of foods, food groups and dietary patterns to maintenance of health.
- helps to investigate the role of diet in the maintenance of health and the reduction of the risk of NCCDs.
- helps to identify dietary factors that influence specific diseases and explains the mechanisms.

4.0 Conclusion

In this unit, you have been exposed to the foci of nutritional research endeavour from the early century till present. Researches in human nutrition in the early century focused on chemical identifications of nutrients in food. The role of essential nutrients, especially, vitamins, in human deficiency diseases was the focus of the half of the twentieth century. The nutrition research endeavour continued after the World War II with the role of diet in the aetiology of NCCDs. Presently, research in nutrition involves the role of antioxidants and other phytochemicals in the prevention of NCCDs. The search on functional foods to promote healthy life span is still on in most developed countries.

5.0 Summary

This unit being a continuation of Unit 2, has expatiated on the foci of nutrition research from early century till present. The unit has illustrated that research studies in nutrition has shifted emphasis from nutrient deficiency diseases as the major causes of morbidity and mortality to non-communicable chronic diseases. In fact, the focus now is the role of diets in the aetiology of NCCDs. This unit has also discussed the usefulness of nutrition research in the promotion of life free from NCCDs. The next unit, you will be exposed to food, the vehicle of diet.

6.0 Self-Assessment Exercise

1. Differentiate between nutrition researches endeavours in the first half of 20^{th} and 21^{st} centuries.

2. List three usefulness of nutrition research.

7.0 References/Further Reading

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Unit 4 Food and Culture

1.0 Introduction

Since you have gone through units one to three, you would have acquired a general understanding of what nutrition is all about, it's historical background together with notable names in the field and research endeavours past and present.

This unit will help you acquire basic understanding of how food and culture affect the diet of an individual or a group.

2.0 Objectives

At the end of this unit, you should be able to:

- define the terms food, food habits, food taboos, staple food and culture
- describe four functions of food
- enumerate the effects of cultural and religious food taboos on the nutritional status of an individual
- list at least five factors that influence food choices.

3.0 Main Content

3.1 Definition of Terminologies in Food and Culture

- Food is an edible digestible, absorbable and utilisable substance that maintains, restores and promote growth and quality health. It can also be defined as an edible substance that human being or animals eat or drink that supply all the nutrients that will sustain, maintain and promote life and growth.
- Food habits also referred to as food culture is defined as the ways in which human beings use food that includes selection, touch, smell and presentation.
- Staple food can be defined as basic food which is the main regular constituent of a meal of a group of people, a tribe, a region or a community. Maize green plantain, cassava or other tubers are staple foods of certain parts of Africa. Rice and potatoes are the staple foods for India and Ireland respectively. Bread is the staple foods for Europe and Hamburger and French fries staple foods for United States. Nigeria staple foods are starchy foods (cassava meals, pounded yam), yam flour grains (millet, maize in the form of pap).
- Culture, Kittler and Sucher defined culture as the 'values, beliefs, attitudes, and practices accepted by members of a group or community. Culture can be learnt, it is not inherited, it is passed from generation to generation.

3.2 The Meaning of Food

Food means different thing to each person depending on the time, place, health, economic and social status.

Food may arouse the feelings of pleasure, prosperity, happiness, sadness, masculinity, feminity, poverty, power or comfort. The culture in which a person lives, the family in which he or she grows up and experiences of travelling widely actually determine what food means to an individual. Food is the vehicle by which one nourishes the body. When staple foods are mainly from plant sources and the culture is not very flexible about adopting newer nutritious food such as soya beans, the nutritional status of such people will be poor.

3.3 The Functions of Food

- The primary function of food is to supply energy to the body. The first body requirement is to have enough energy before performing other functions. The energy nutrients include carbohydrates, fats and proteins. The food source of energy is carbohydrate, fats and oils.
- Food nutrients also build and maintain body tissues. The body building material in foods is protein.
- Food nutrients also regulate body processes. The minerals, the vitamins and water each of these nutrients present in the food you consume perform certain regulatory functions that are crucial to the normal operation of the body system. Such regulations include the movement of fluids, the coagulation of blood, maintenance of normal body temperature and control of the balance between acid and base.
- Food serves as a socialising agent or as means of friendship. It also serves as means of developing social rapport.
- Food is also a way of satisfying certain emotional needs.
- Food is also used as a means of expressing feelings. The serving of favourite foods and its withdrawal is an expression of appreciation and punishment respectively.

3.4 Cultural and Religious Food Habits

Cultural and religious food habits are dictated by the culture or the religion of the group. One of the major causes of childhood malnutrition in some developing countries is cultural food taboos to infants and also to pregnant women. Certain foods are forbidden to pregnant women and infants either due to religion or tradition. Snails and snakes for examples are forbidden to infants and pregnant women because such foods will make the infants unable to walk .Some religions prohibit certain foods, especially of animal origin, such as pork, bats, and certain fish.

3.5 Factors Influencing Food Choices

- Family influences especially that of the care giver (the mother). Whatever a mother likes she gives to the family and the children gradually learn through observation.

- Mother's nutritional knowledge also influences food habits. The knowledge of adequate nutrition intake on regular basis will certainly help to nurture the family to eat healthfully.
- Advertising is one of the major instruments used by food industries to appeal to consumers to buy their food products.
- Religion also influences food habits. The Christians and Muslims when fasting have certain food habits which everybody in the family accepts.
- Flavour and texture are two of the most significant factors for choosing certain foods.
- Peer influences affect food choices especially among the young ones.
- Current health status is also a factor in food choices. A healthy person has a good appetite while the contrary is the case for an ill person.
- Social changes are also leading factors for food choices. The higher the social status, the more the exposure to convenience foods or fast food outlets.

4.0 Conclusion

In this unit you have learnt what food and culture are all about. In defining food and culture, you have noted that food is the vehicle of nourishing the body to perform maximally. You have also been exposed to the importance of staple foods in improving the health of an individual. You should be able to define food, staple foods and give specific example, for a particular tribe in Nigeria. The unit has illustrated the different meaning of food to different people. It has highlighted different functions of food. The importance of culture and religion in the selection of food has also been discussed.

You should be able to list those foods being prohibited because of culture and religion in your locality. Finally, the unit has dealt with factors influencing food choices. You should be able to list those factors influencing your own choice of foods.

5.0 Summary

This unit has examined food and culture in the selection of foods for healthy living. It has also defined key terminologies under the topic. Meaning of food and its functions in promoting quality health have been elucidated in the unit. Factors influencing food choices are also shown to be important in maintaining nutritional status. The second module will be built on basic understanding of composition of food (carbohydrates, proteins, fats, vitamins, minerals, water and fibre).

6.0 Self-assessment exercise

1. Define the terms staple food, food habits and give specific examples.
2. List four factors that influence food choices.

7.0 References/Further Reading

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