



UNIVERSITY OF ILORIN
ILORIN, NIGERIA

ISBN: 978-36284-0-2

HISTORY AND PHILOSOPHY OF SCIENCE

EDITED BY:
PROF. WAHAB O. EGBEWOLE
DR. (MRS.) ADENIKE M.O. ABDULRAHEEM

TABLE OF CONTENTS

1.	The Structure of Science Abimbola, I.O.	1
2.	Philosophical Problems and Scientific Explanations Akanji, M.A. and Yakubu, M.T.	21
3.	Concept of Matter Akoshile, C.O. and Abdus-Salam, N.	33
4.	Conservation of Conventional and Renewable Energy Sources and their Conversion Techniques Omosewo, E.O., Olaoye, J.O., Ajibola, T.B., Ajimotokan, H.A.	46
5.	Applications of Blood Group Systems and DNA Finger Printings ARISE, R.O., KURANGA, S. A., and OGUNJEMILUA, S.B	71
6.	Medicinal plants: myths, facts, Conservation and tissue culture techniques Yakubu, M. T., Akanji, M. A. and Adeyemi, S. B.	79
7.	Atmospheric Environment, Air Pollution and Public Health Adekola, F. A., and Abdul Raheem, A. M. O.	94
8.	Food Production and Preservation for Food Security: The Place of Cooperatives In Nigeria Omotesho, A. O., Joseph, J.K., Muhammad-Lawal, A. and Kayode, R. M.	107
9.	Global Threat of Counterfeit Medicines Williams, F. E. and Olurinola, P. F.	123
10.	Fundamentals of Poultry Production Adeyina, A. O. and Atteh, J. O.	135
	Human Nutrition- A Life Course Approach Temidayo Oladiji and Deborah Opaleke	151
12.	Achieving Knowledge Management Functionalities in the Emerging Technology-Driven Society Using Information Technology Jimoh, R. G. and Oyelakin, A. M.	165
13.	Science and Technology in the Service of Man Ayeni, A. A.	176
14.	Concepts of Hypothesis Testing in Sciences, Social Sciences and Humanities Adeleke, B. L. and Yahya, W. B.	181

15. Microbes and Diseases
Andes, A. T.

16. Geomorphology of Africa
Ige, O. O., and Ogunsanwo, O.

195

202



HUMAN NUTRITION- A LIFE COURSE APPROACH

¹*Temidayo Oladiji and ²Deborah Opaleke

¹Department of Biochemistry, University of Ilorin, Ilorin, Nigeria

²Department of Home Economics and Food Science, University of Ilorin, Ilorin, Nigeria

*corresponding email: toladiji@unilorin.edu.ng

INTRODUCTION

Good nutrition is a necessary condition for good health and general well-being. Good nutrition can only be attained by eating good and nutritious foods. Further, it can be maintained by eating foods also prepared under good hygienic condition with proper management of the nutrients (for maximum nutrient retention during processing). Nutrition contributes to wellness. Therefore, healthful diet is part of disease prevention. Examples of nutrient deficiency diseases include scurvy, goiter, rickets, and anemia. Some forms of chronic diseases are influenced by nutrition. These include heart disease and diabetes.

Nutrition is the science that interprets the relationship of foods to the functioning of the living organism. This will include the intake of food, elimination of wastes and syntheses that are essential for maintenance, growth and reproduction. In other words, the interaction of food, the nutrients and other substances therein, their action and balances in relation to health and diseases. Nutrition is so important that it has become a national goal to promote optimal health and disease prevention.

Unfortunately, a general dearth of knowledge exists in human nutrition especially as it relates to nutrition of the vulnerable groups (children, pregnant women and the aged). Also, the association between the onset of certain diseases and diet need to be understood. The present chapter therefore provides information on some aspects of human nutrition.

OBJECTIVES

At the end of the course, students should be able to:

- (i) define nutrition;
- (ii) explain the concept of macro- and micro- nutrients;
- (iii) discuss the standards for measuring healthy people's energy requirements;
- (iv) list the various forms of malnutrition;
- (v) enumerate the features of kwashiorkor and marasmus;
- (vi) explain nutrition in the adolescent, pregnant women and the aged; and
- (vii) discuss the causes measurement and management of obesity

FOOD NUTRIENTS

Food is able to perform its functions because they contain nutrients. **Nutrients** are chemicals in foods that our body use for energy and to support the growth, maintenance, and repair of our tissues. There are two broad classes:

- i. **Macronutrients** are nutrients that are required in relatively large amounts. These are carbohydrates, lipids and proteins.
- ii. **Micronutrients** are nutrients required in smaller amounts like vitamins and minerals.

Nutrients can also be classified as either organic or inorganic. **Organic nutrients** contain an element of carbon that is an essential component of all living organisms e.g. Carbohydrates, lipids, proteins and vitamins. **Inorganic nutrients** however do not contain carbon e.g. Minerals and water.

In man, nutrients are supplied through the food and different food items contain different amount of nutrient. For example, rice and bread are rich in carbohydrate while food like beans is rich in protein.

The food sources and functions of food nutrients are summarised in Table 1

Table 1: Nutrients: the food sources and functions

NUTRIENT	ENERGY/g	FOOD SOURCE	FUNCTION
Carbohydrate	4	Bread, rice, yam, biscuits, sugar	Energy
Fat	9	Oils, butter, cheese,	Energy
Protein	4	Meat, fish, egg, milk	Growth and repair
Minerals	-	Vegetables and fruits	Control of body processes
Vitamins	-	Vegetables and fruits	Control of body processes
Water	-	Drinking water, beverages, fruits and vegetables	Control of body processes

Good nutrition implies the intake of diets containing all the nutrients in proportions necessary for the proper functioning of the body. A diet containing all required nutrients in adequate quantity is said to be a balanced diet. However, because foods are generally rich in different types of nutrients, a combination of foods will often be necessary to attain balance. For example, a meal of pounded yam taken with vegetable soup and meat or fish will likely contain all the macro nutrients and many of the micronutrients in adequate quantities. The disruption of the concept of balance coupled with changes in the way food is prepared, processed, and lifestyle changes lead to imbalance in energy metabolism which has been proposed to be responsible for the appearance of various metabolic syndromes (affliction of affluence).

NUTRIENT REQUIREMENTS

The amount of nutrient required varies with age, sex, activities and general well-being. Special requirements of pregnancy and lactation have also been identified. There are standards for measuring healthy people's energy and nutrient requirement. A set of four values are used to measure the nutrient intake of healthy people

Dietary Reference Intakes (DRI) consists of 4 values:

Estimated Average Requirement (EAR): The average daily intake level of a nutrient that will meet the needs of half of the **healthy** people in a particular category used to determine the Recommended Dietary Allowance (RDA) of a nutrient

Recommended Dietary Allowances (RDA): The average daily intake level required to meet the needs of 97 – 98 % of **healthy** people in a particular category

Adequate Intake (AI): Recommended average daily intake level for a nutrient

Based on observations and experimentally determined estimates of nutrient intakes by **healthy** people Used when the RDA is not yet established e.g. for calcium, vitamin D, vitamin K, and fluoride.

Tolerable Upper Intake Level (UL): Highest average daily intake level likely to pose no risk of adverse health effects to most people Consumption of a nutrient at levels above the UL, the potential for toxic effects and health risks increases.

The Food Guide Pyramid (Figure 1) was introduced in 1992 and further modified in 2005 to reflect the latest in nutrition science. Dietary Guidelines place stronger emphasis than past guidelines on decreasing calorie intake as well as increasing physical activity.

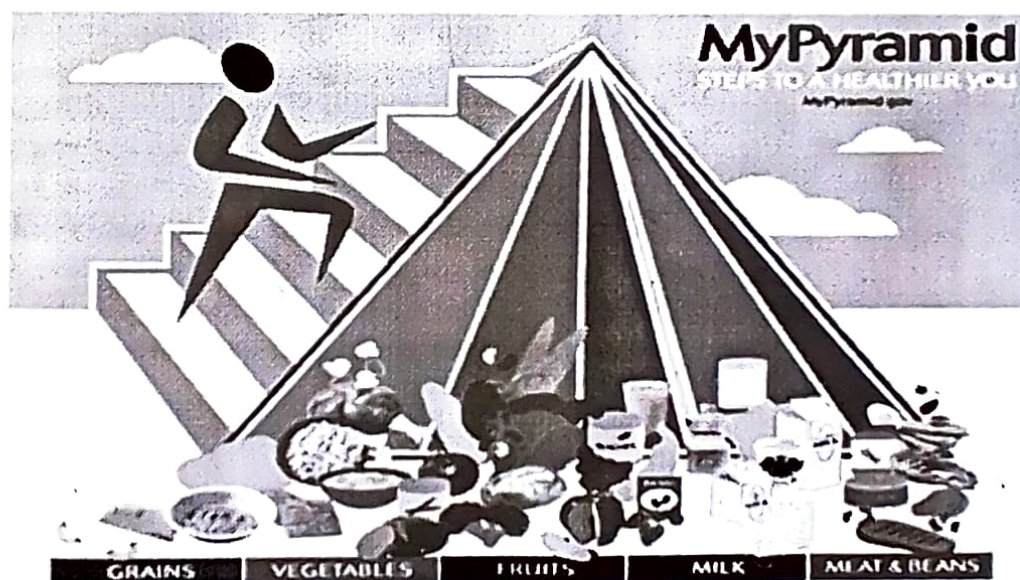


Figure 1: Food Guide Pyramid

The 6 colour bands represent the different food groups, and illustrate that foods from all groups are needed each day. MyPyramid symbolises a simple, personalised approach to remind consumers to make healthy food choices and to be active every day. **Activity** is represented by the steps and **personalisation** by the individual.

NUTRITION IN CHILDREN

Malnutrition remains one of the most common causes of morbidity and mortality among children throughout the world. Approximately 9 % of children below 5 years of age suffer from wasting and are at risk of death or severe impairment of growth and psychological development. In 2008, of the 8.8 Million global deaths of children under 5

years of age, 93 % occurred in the developing countries of Africa and Asia and over a third of all deaths can be attributed to underlying malnutrition

Childhood Malnutrition

Protein Energy Malnutrition (PEM): This is the most common deficiency disease in the world with about one hundred children affected to a moderate or severe degree. PEM is caused by a deficient intake of energy and usually, protein. Secondary PEM can result as a result of other complications like AIDS, chronic kidney failure, inflammatory bowel disease and other illnesses that impair the body's ability to absorb and / or utilise nutrients, or compensate for nutrient loss.

Causes

Several factors have been identified to be the cause of childhood malnutrition. These include:

- poverty/ insufficient food production
- poor living conditions leading to consumption of contaminated foods and subsequent exposure to infection frequently
- lack of education/ ignorance on nutrient requirement for children
- another pregnancy resulting in improper feeding of children especially breast feeding
- return of mother to work
- poor family planning / multiple births creating competition for the limited food
- paternal dispute oftentimes resulting in child neglect
- war and famine which oftentimes make food unavailable

Summarily, all these factors can be defined by lack of education, poverty and lack of food.

Signs:

Some of the features of PEM are:

- i. muscle wasting;
- ii. the belly may look prominent; and
- i. the skills develop more slowly.

The more severe ones are marasmus, kwashiorkor, marasmic kwashiorkor and iron deficiency anaemia.

Features of Marasmus (figure 2a)

- i. Child often less than one year old
- ii. There is low weight for age (usually below 60 %)
- iii. There is little or no subcutaneous fat therefore skin is loose
- iv. The child looks like an old man
- v. Noedema and there may be no changes in hair colour
- vi. Child usually hungry

Since the body breaks down its own tissue to use as calorie, children suffering from marasmus lose all body fat and muscle strength and acquire a skeletal appearance. They suffer from frequent infection due to weakened immune system.

Features of Kwashiorkor (Also called wet PEM; figure 2b)

Child usually is aged 1-3 years and presents the following features:

- i. Growth retardation
- ii. More subcutaneous fat than in marasmic child
- iii. There is oedema (mainly in the feet and lower legs)
- iv. The child appears moon faced
- v. Hair is discoloured
- vi. Hair is sparse and is easily pulled out
- vii. Presence of anaemia
- viii. Loss of appetite

The body's immune system is weakened, behavioural development is slow and mental retardation may occur. Children may grow to normal height but are abnormally thin. It can also develop in children who are severely burned, suffered trauma or had sepsis (tissue destroying infection).



Figure 2: (a) Marasmus



(b) Kwashiorkor

Prevention: The best way to prevent childhood malnutrition is by breast feeding a child for the first six months and thereafter, introduces the child to balanced weaning foods.

ADVANTAGES OF BREAST FEEDING

1. Breast milk is complete food
2. It is cheaper
3. It has contraceptive properties
4. It helps in the contraction of the womb, thereby helping the mother to return to shape
5. It is always available in correct composition and temperature
6. No utensils required therefore less chance of germ infestation
7. It has anti-infective properties such as
 - Immunoglobulin A (act against certain bacteria e.g. E. Coli and some viruses)
 - Lactoferrin which binds iron thereby making it unavailable for certain microorganisms.

- Lysozymes which breaks down certain harmful bacteria
 - White blood cells for fighting infection
 - The bifidus factor, a nitrogen containing carbohydrate required for the growth of *Lactobacillus bifidus* a lactic acid producing bacteria.
8. Breast feeding confers protection from allergic diseases e.g. infantile eczema.
 9. It gives a woman a sense of womanhood
 10. It encourages closeness between mother and child
 11. Less environmental pollution

Excuses for not Breast Feeding

1. Another pregnancy
2. Return of mother to work
3. Lack of education
4. The adoption of western belief that breast feeding in public is immodest
5. Maternal stress
6. Mental health problems (e.g. postpartum depression, eating disorders)
7. Media portrayal of bottle-feeding as the norm
8. Commercial promotion of infant formula through distribution of hospital discharge packs, coupons of free or discounted formula, and TV and magazine advertising.

CAUTION (WHEN BREAST FEEDING IS NOT ADVISED)

- Maternal exposures to toxins (e.g. Heavy metals, prescribed drugs, drugs, organic chemicals).
- **Inborn errors of metabolism** (e.g. Galactosemia, PKU-lack of the enzyme **phenylalanine hydroxylase**)
- Risk of transmission of diseases from mother to infant (HIV/AIDS, Tuberculosis).

NUTRITION IN ADOLESCENCE AND ADULTHOOD

Adolescence is a time of rapid growth, and the primary dietary need at that period is for energy - often reflected in a voracious appetite. Ideally, foods in the diet should be rich in energy and nutrients. Providing calories in the form of sugary or fatty snacks can mean nutrient intake is compromised, so adolescents should choose a variety of foods from the other basic food groups:

- Plenty of starchy carbohydrates - bread, corn meal, rice, pasta, breakfast cereals, couscous and potatoes
- Plenty of fruit and vegetables - at least five portions every day
- Two to three portions of dairy products, such as milk, yoghurt and pasteurised cheeses
- Two servings of protein, such as meat, fish, eggs and beans

Adolescents are advised against too much fatty foods as well as sugar rich drinks. Other important dietary habits to follow during adolescence include:

- Drinking at least eight glasses of fluid (preferably water) a day.
- Eating regular meals, including breakfast, as it can provide essential nutrients and improve concentration in the mornings. Choose a fortified breakfast cereal with semi-skimmed milk and a glass of fruit juice.
- Taking regular exercise, which is important for overall fitness, cardiovascular health, as well as bone development.

Not every adult has the same nutritional needs. An adult individual needs to balance energy intake with his or her level of physical activity to avoid storing excess body fat. Dietary practices and food choices are related to **wellness** and affect health, fitness, weight management, and the prevention of **chronic** diseases such as **osteoporosis**, **cardiovascular** diseases and **diabetes**.

The actual amount of any nutrient a person needs, as well as the amount each individual gets from his or her diet will vary. Many adults do not receive enough **calcium** from their diets, which can lead to osteoporosis later in life. Other nutrients of concern are potassium, fiber, magnesium, and **vitamin E**. Some population groups also need to get more **vitamin B₁₂**, **iron**, folic acid, and **vitamin D**. These nutrients should come from food when possible, then from supplements if necessary.

As teenagers reach adulthood, the basal energy needs for maintaining the body's physiological functions (**basal metabolic rate** or BMR) stabilise, therefore energy requirements also stabilise. BMR is defined as the energy required by the body to keep functioning.

It is important to reduce energy intake at the onset of adulthood, and to make sure that all of one's nutritional needs are met. This can be accomplished by making sure that an adequate amount of energy is consumed (this will vary by body weight, degree of physical fitness, and muscle vs. body fat), and that this amount of energy is adjusted to one's level of physical activity. Foods that are chosen to provide the energy must be highly nutritious, containing high amounts of essential nutrients such as **vitamins**, **minerals**, and essential **proteins**.

It is usually at this age that young adults start gaining body fat and reducing their physical activity, resulting in an accumulation of fat in the abdominal areas. At the onset of adulthood, energy requirements usually reach a plateau that will last until one's mid-forties, after which they begin to decline, primarily because activity levels and lean muscle mass (amount of muscle vs. body fat), which represents the BMR, decrease. It is believed that the changes in body composition and reduced lean muscle mass occur at a rate of about 5 % per decade, and energy requirements decrease accordingly. However, these changes in body composition and decreased energy requirements can be prevented by maintaining regular physical activity, including resistance training, which helps maintain lean muscle mass and prevent deposition of excess body fat.

Many adults ignore the role that fluids play in nutrition. Most people will get adequate hydration from normal thirst and drinking behaviour, especially by consuming fluids with meals.

Age group	Energy* (kcal)	Protein (g)	Total Fat (g)	SFA (g)	Carbo-hydrates (g)	Dietary fibre (g)	Cholesterol (mg)	Ca (g)	Na (mg)	Fe (mg)	Vit A (mcg)	Folic Acid (mcg)	Vit C (mg)
Men													
18- 29 yrs	2550	68	71	23.6	351	26	300	0.4-0.5	1700	6	750	200	30
30- 59 yrs	2500	68	69	23.0	344	25	300	0.4-0.5	1650	6	750	200	30
60 yrs and above	2100	68	58	19.3	289	21	300	0.4-0.5	1400	6	750	200	30
Women													
18 - 29 yrs	2000	58	56	18.6	275	20	300	0.4-0.5	1350	19	750	200	30
30- 59 yrs	2000	58	57	19.0	275	20	300	0.4-0.5	1350	19	750	200	30
60 yrs and above	1800	58	50	16.7	248	18	300	0.4-0.5	1200	6	750	200	30
Pregnant women													
- full activity	+285	+9	+8	+6	+39	+3	300	1.0-1.2	+200	19	750	400	50
- reduced activity	+200	+9	+6	+2	+28	+2	300	1.0-1.2	+150	19	750	400	50
Lactating women													
- first 6 months	+500	+25	+14	+4.6	+69	+5	300	1.0-1.2	+350	19	1200	400	50
- after 6 months	+500	+19	+14	+4.6	+69	+5	300	1.0-1.2	+350	19	1200	400	50

Legend:

SFA - saturated fat; **Ca** - calcium; **Na** - sodium; **Fe** - iron; **Vit A** - vitamin A; **Vit C** - vitamin C

Please note:

- Recommended energy intakes (*) are for individuals with sedentary to light activity levels.
- The above recommended daily intakes vary depending on physical activity and physiological state of an individual, e.g. pregnancy and lactation.
- The recommended dietary allowances are average daily intakes of nutrients over a period of time for the majority of the population. They are not absolute daily dietary requirements.

Nutrition in the aged

The elderly population is divided into 3 age groups:

1. Ages 65-74 referred to as young elderly;
2. Ages 75-84 referred to as the elderly; and

3. Ages 85+ referred to as the old.

The aging process shows inter-individual variability in its rate of development. The determinants of the rates of aging of systems and tissues have been reported to be largely genetic. Therefore, premature aging of cells and tissues can occur and is due to genetic factors and to long-term exposure to physical or chemical environments that cause irreversible tissue damage. However, the aging process alters body composition so that nutritional status changes as humans get older. Although the energy needs decrease as people age because lean body mass decreases and levels of physical activity decrease, the chance of meeting the needs of all nutrients also decreases.

Elderly persons are particularly vulnerable to malnutrition. This is because attempts to provide them with adequate nutrition usually encounter many practical problems. According to WHO, the nutritional requirements of the elderly are not well defined, and older person's energy requirement per kilogram of body weight is also reduced because both lean body mass and basal metabolic rate decline with age. Also, the processes of ageing have been reported to affect other nutrient needs. For example, while requirements for some nutrients may be reduced, some data suggest that requirements for other essential nutrients may in fact rise in later life.

Malnutrition in older persons

The prevalence of malnutrition in the aged has been reported to be as high as in children. Many of the diseases suffered by older persons are the result of dietary factors, some of which have been operating since infancy. These factors are then compounded by changes that naturally occur with the ageing process.

Generally speaking, it has been found that there is improper eating as people age. This has been attributed to a number of factors which include:

- i. Low income.
- ii. Lack of knowledge in nutrition.
- iii. Loneliness.
- iv. Functional impairment e.g. depression, dementia, drugs, diseases, dentition problems, dysphagia, diets-restrictive diseases
- v. Digestive problems.
- vi. Gastrointestinal problem such as changes in sense of taste and smell, less secretion of saliva and digestive juices, causing absorption problems and slower movements of the gastrointestinal tract.

Another factor is the price of foods rich in micronutrients, which further discourages their consumption. Compounding this situation is the fact that the older people often suffer from decreased immune function which contributes to this group's increased morbidity and mortality. Other significant age-related changes include the loss of cognitive function and deteriorating vision, all of which hinder good health and dietary habits.

In the aged, malnutrition could result in one or more of the following:

- Lower quality of life
- Depression
- Increased susceptibility to infection
- Sarcopenia (loss of muscle mass)
- Increased number of falls
- Complications during hospitalisation
- Increased tendency for pressure sores
- Increased mortality

Foods which may help promote regular bowel function, and prevent constipation include:

- Fruits
- Vegetables
- Dried fruits
- Whole grain cereals
- Beans
- Plenty of fluid. At least (30 ml/kg)
- yoghurt

It is also necessary for the aged to engage in some physical activities daily.

Dietary changes seem to affect risk-factor levels throughout life and may have an even greater impact in older people. It is therefore of uttermost importance to give adequate attention to diet during old age.

NUTRITION IN PREGNANCY AND LACTATION

The fetus is not a parasite; it depends on the mother's nutrient intake to meet its nutritional needs. Periods of growth and development of the fetal organs and tissues occur throughout pregnancy therefore essential nutrients must be available in required amounts during these times for fetal growth and development to proceed optimally.

Well-nourished women will generally have adequate reserves of nutrients which can maintain delivery of most substrates to the fetal tissues, even if their intakes are compromised in the short to medium term. This is because the delivery of nutrients depends on maternal intake, maternal stores and Placental exchange.



Animal experiments show that under nutrition in utero leads to persistent change in blood pressure, cholesterol metabolism, insulin response to glucose and obesity. The immediate response of a fetus to under nutrition is to break down its own substrates to provide energy. More prolonged under nutrition leads to growth retardation. Slowing of growth in late gestation leads to disproportion in organ size (e.g. reduced growth of the kidney which is rapidly developed during late gestation).

IMPORTANCE OF BALANCED NUTRITION DURING PREGNANCY

- Optimises maternal health
- Reduces risk of birth defects
- Reduces suboptimal fetal development
- Reduces chronic health problems in the future

OBESITY

Obesity is defined as an excess of body fat. By using body weight as an index, obesity is a weight greater than 20 % more than the average desirable weight for men and women of a given height. Obesity results when there is an imbalance between energy intake and energy expenditure. Obesity is a risk factor for other degenerative diseases, such as type II (adult onset) diabetes, diseases of heart and circulation, and certain cancers.

Causes

1. **Over Eating:** This may result from primary failure in the regulation of ingesting behaviour at the cognitive level. This usually results in excessive caloric intake that exceeds energy needs of the individual.
2. **Sex:** It is common in women in whom it is liable to occur after pregnancy, especially repeated pregnancies. A woman may gain as much as 12.5 kg during pregnancy. Most of this will be in form of adipose store mainly for the demand of lactation. However, many women gain more weight and retain part of this weight becoming progressively obese with each succeeding child. Males have a higher resting metabolic rate than females, so males require more calories to maintain their body weight.
3. **Age:** As a general rule, as you grow older, your metabolic rate slows down and you do not require as many calories to maintain your weight.
4. **Environment/Culture:** An environment where people eat high fat and high sugar diets and take little exercise, causes more problems with excess weight and obesity than one where people eat low fat diets and get regular exercise. Cultural belief also contributes to the development of obesity.
5. **Emotional Factors:** Many people over eat when they're stressed, bored or angry. Over time, the association between emotion and food can become firmly fixed. Depression or stresses are also causes of obesity and other patterns of disordered eating.
6. **Lack of Physical Activity:** Lack of physical exercise is definitely one of the major causes of weight gain and obesity.

TECHNIQUES AND STANDARD FOR MEASURING OBESITY

Body mass index (BMI): This is calculated by dividing the body mass in kg by square of height in meters. ($BMI = \text{kg/m}^2$). The BMI is used to define underweight, overweight and obese individuals.

BMI (kg/m^2) Categories:

- Underweight = <18.5
- Normal weight = $18.5\text{--}24.9$
- Overweight = $25\text{--}29.9$
- Obesity = BMI of 30 or greater

Skinfold thickness = Waist/hip-ratios

Body Fat Distribution: "Pears" vs. "Apples"

Excessive body fat resulting from an imbalance between energy intake and expenditure is the most important nutritional problem in developed countries and is rapidly becoming a global epidemic; a definition of a healthy diet that fails to address this problem would be deficient. Some well-intended guidelines are highly prescriptive in terms of energy intake or servings per day of each food group. A fundamental problem is that even the healthiest combination of foods consumed in slight excess, by only a percentage or two, over an extended period will lead to overweight.

CASE STUDY

A 25 year old female weighing 81 kg, height of 1.67 m and of moderate physical activity has a BMI of 29 kg/m^2 . Healthy BMI ranges from $18.5 - 24.9 \text{ kg/m}^2$, therefore, Healthy weight range is 43.3 - 58.5 kg. Based on the current weight, height and activity level, Daily Calorie requirement is **2291 calories**. This is what is needed by this person to maintain the current weight. However, food is not the only thing that affects weight management; exercise or lack of it will impact the amount of calories burned and therefore the net caloric intake. To change your weight by 0.5 kg or 1 lb in one week, you must increase or reduce your net caloric intake by 500 calories per day or 3500 calories per week.

TREATMENT

A poor diet and lack of exercise are the most common causes of obesity, there are some fairly simple treatments for obesity.

- i. Incorporating more natural foods into your diet.
- ii. Drinking more water
- iii. Cutting out junk food and getting into the habit of exercising several times every week

CONCLUSION

It is a fact now that optimal health is linked to good nutrition. The importance of good nutrition is the main preventive measure against a high number of human diseases. The importance of good nutrition to achieve optimal health is unquestionable. There is growing number of people who are aware of the importance of good nutrition and are turning towards foods that are enriched with different herbs, vitamins and minerals. More and more foods will be tailored to improve health and extend life. It is clear now that nutrient needs vary with age and physiological state. Therefore, nutrition education should be emphasised for all as this will help prevent a lot of diseases.

EVALUATION STRATEGIES

Study Questions

- i. What is nutrition?
- ii. List the features of Marasmus and kwashiorkor
- iii. List the causes of malnutrition in children
- iv. How is the BMI useful in measuring obesity?
- v. What causes improper nutrition in the aged?

REFERENCES

- Begum, M. R. (2007) *A textbook of foods, nutrition and Dietetics*. Sterling private publishers limited, New Delhi. India
- Food and Nutrition Board, (2001) *Institute of Medicine, National Academies of Science. DRIs for individuals*
- Hodder and Stoughton Publisher. London. UK: Fox, A.B and Cameron, A.G (1990). *Food Science: A chemical approach*
- Oladiji, A.T. (2003). Tissue levels of iron, copper, zinc and magnesium in iron deficient rats. *Biokemistri*, 14 (1): 75- 81.
- Oladiji, A.T. and Ogunyemi O.O. (2003). Status of some citric acid cycle dehydrogenases in selected tissues of rats fed iron- deficient diets. *Nigerian Journal of Biochemistry and Molecular Biology*, 18(3): 133 - 138.
- Oladiji, A.T., Abodunrin, T.P., and Yakubu, M.T. (2007). Some physicochemical characteristics of the oil from *Tetracarpidium conophorum* (Mull. Arg.) Hutch and Dalz Nut, Nigeria. *Journal of Biochemistry and Molecular Biology*, 27(2): 93-98.
- Oladiji, A. T., Jacob, T. O. and Yakubu, M. T. (2007). Anti-anaemic potentials of aqueous extract of *Sorghum bicolor* (L.) Moench stem bark in rats. *Journal of Ethnopharmacology* 111: 651-656.
- Oladiji, A.T. (2012). Little Giants in Foods. 102nd Inaugural Lecture, University of Ilorin, Ilorin. March, 22nd 2012. Published by University of Ilorin Library and Publications Committee.

- Shils E. Maurice, Moshe Shike, A. Catharine Ross, Benjamin Caballero, and Robert J. Cousins (2005). In: Modern nutrition in health and diseases. Lippincott Williams & Wilkins, UK.
- USDA (2010). Dietary Guidelines for Americans U.S. Department of Agriculture U.S. Department of Health and Human Services www.dietaryguidelines.gov.
- WHO (1999). Management of severe malnutrition: a manual for physicians and other senior health workers. Geneva, WHO.
- Wills, D.E (1985). Biochemical basis of Medicine. John Wright and Sons LTD., Bristol.