Diet and Nutrition
for Nursing Students

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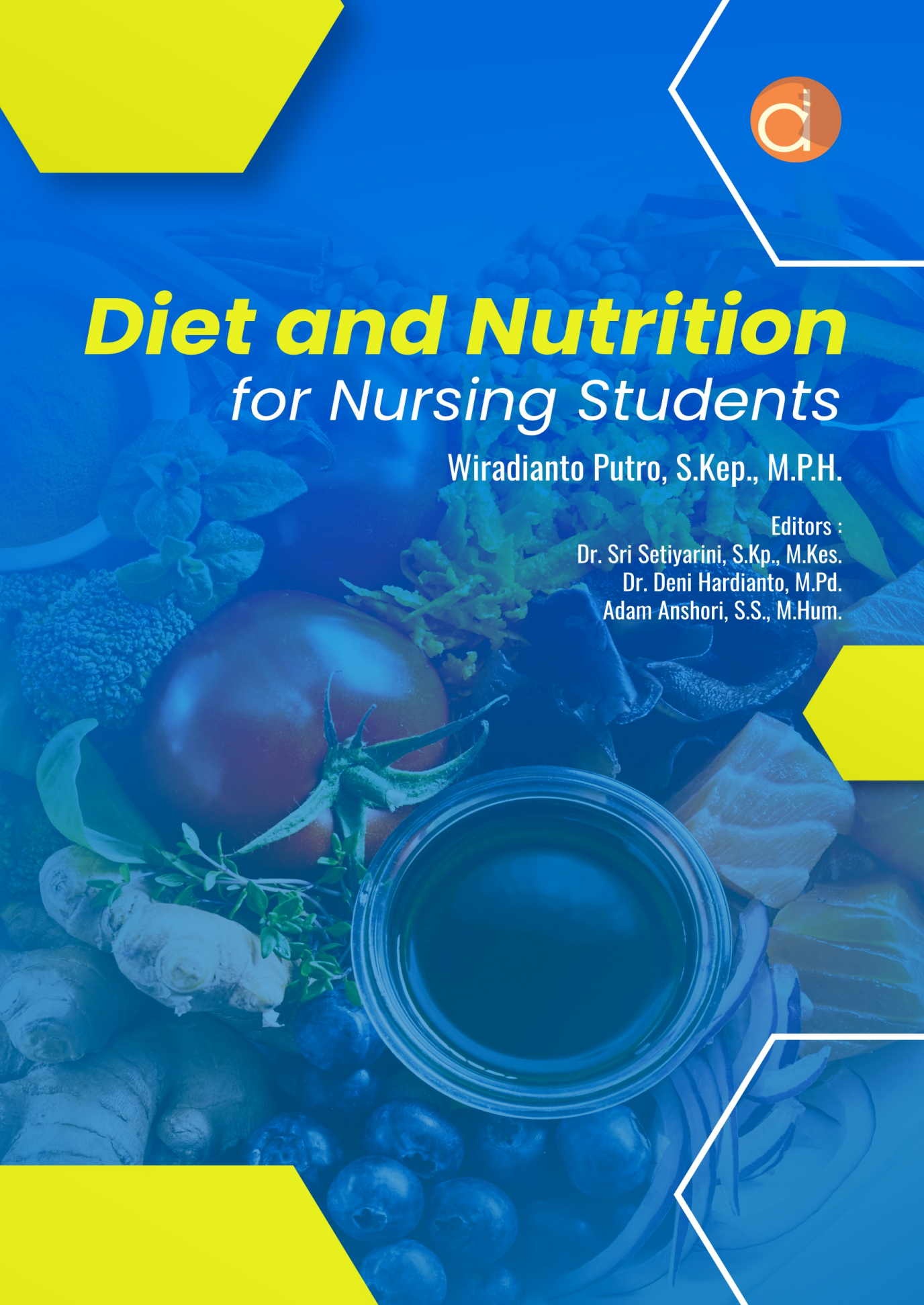

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FOREWORD

Praise and gratitude to Allah for the favor upon us, enabling us to complete the second semester's *Diet and Nutrition for Nursing Students* textbook. Helping students comprehend the topics they must study and comprehend in diet and nutrition courses is the main goal of this book. Also, this book will include comprehensive details regarding the facts that will be learned from numerous dependable sources that are helpful as supplementary context for the chapters being studied. We are aware that this book was not written as a consequence of our own labor of love. The writing, material selection, questions, and other assistance from numerous individuals allowed us to finish this book. We would like to thank everyone who has given us advice and insight both before and during the production of this textbook. Also, we really know of how imperfect the book we are creating still is. So that we can write books even better in the future, we seek for help and feedback from readers.

Regards,
Wiradianto Putro

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CHAPTER ONE
BASIC CONCEPTS OF NUTRITION FOR NURSES

Overview

A nurse will always be in touch with clients/patients in good circumstances healthy or sick. The nurse's duties include how to improve health status to all healthy clients/patients in order to achieve optimal health status, while for clients/patients who are sick, nurses help patients achieve his recovery. The most important aspect to be able to improve human health and healing of disease is by meeting nutritional needs(Ida and Eko, 2016). So, to help clients/patients meet their nutritional needs, we must understand the science of nutrition. Studying nutrition is not only beneficial for the nursing profession but also for us as a person. If we do not understand the food will cause disease or slow down the healing process, otherwise understand which food we eat improve health or help cure disease This chapter will help you understand the basic concepts of nutritional science for nurses. The basic science of nutrition will be described in this chapter includes an introduction to nutrition and the types of nutrients for introduce basic concepts related to nutrition, and how nurses can to assess nutritional status. This chapter is organized into three topics which include:

Topic 1: Introduction to Nutrition and Types of Nutrients
Topic 2: Assessment of Nutritional Status

After studying this chapter, you are expected to be able to explain the basic concepts of science nutrition, explaining the types of nutrients, and how you as a nurse can explain the assessment of nutritional status. In particular, you are expected to:

1. mentioning the definition and scope of nutrition science; nutrition; and food,
2. to explain the causes of nutritional disorders,
3. explain the process of digestion of food,

4. explain the impact of nutrients on body processes,
5. Explain the various nutrients: carbohydrates, fats, proteins, vitamins, minerals, and water
6. Explain the end result of digestion of each nutrient,
7. mentioning the impact of nutrient deficiency,
8. Mention examples of food based on its nutritional content.
9. Mention the meaning of nutritional status
10. explain the method of direct nutritional status assessment
11. mention the method of assessing nutritional status indirectly,
12. mention the advantages or disadvantages of nutritional status assessment methods

The process of learning the Nutrition for Nurses material that you are studying will can run smoothly and be easier to understand if you follow the following learning steps:

1. Study each Topic in each chapter as well as possible and discuss it thoroughly independently or in groups.
2. Take each practice question as well as the f test and compare your answers with those available at the end of each chapter.
3. Discuss the answers to the questions and look for the right answers in chapter on the basic concepts of nutrition you are studying.

A. Definition of Nutritional Sciences

Let’s start from the definition of nutrition. In fact, there are lots of experts define various terms in the science of nutrition. For convenience, on this Topic you given only one definition. The definition of the science of nutrition (nutrition science) is "Science that learn everything about food in relation to health optimal". While what is referred to as food is “Materials other than drugs that are contains nutrients and/or chemical elements/bonds that can be converted into substances nutrition by the body, which is useful if it is included in the body. From this understanding it is clear that drugs do not include food, and all supplements that contain substances. Nutrition can be categorized as food. You need to

know that the meaning of nutrition is classic or ancient nutrition is only associated with the health of the body only. Which means nutrition is said to be an aspect related to the basic functions of these nutrients, namely generate energy, grow and maintain tissues, and regulate processes metabolism in the body. In this modern era, the understanding of nutrition is not only limited the basic function of nutrition and health alone but nutrition has been linked to work ability, productivity, IQ, and economic status (Martín-Rodríguez et al., 2022). The purpose of the science of nutrition itself is achieve, improve, and maintain a healthy body through consumption food.

B. Etiology of Nutritional Disorders

Nutrition has started from food production, which means starting from the preparation of plant/animal seeds livestock, care during the growing season or raising animals, post-harvest treatment for example the supply, distribution and processing of food. This includes the scope of nutrition is the consumption of food, ways of using food by the body in good condition healthy or sick. While the science related to nutrition is Biochemistry, Biology, Physiology, and Pathology.

In terms of causes, nutritional disorders can be divided into causes of primary factors and causes of secondary factors. All right, now what is called the primary factor? The primary factor means all the nutritional problems due to the wrong arrangement of food, both in terms of quantity and quality. Which include; lack of food supply, poor distribution of food, poverty, ignorance, and wrong eating habits. So the factors that cause no availability of food to be eaten from upstream to downstream.

The following is secondary factor causes include all factors that cause nutrient deficiencies reaches the cells of the body after food is consumed, includes aspects; 1) anatomy, for example patients with congenital abnormalities of the oral cavity, tumors of the esophageal region, and paralysis masticatory muscles in stroke; 2) absorption, for example malabsorption patients, patients who

experiencing small intestine infection (*Thypus Abdominalis*), and patients with post-digestive surgery; 3) metabolism/utilization, for example in patients with Diabetes Mellitus who lack insulin; 4) excretion, for example patients who are unable to excrete the waste products of food metabolism; and 5) drugs, for example patients taking drugs they interact with food which cause certain nutrients cannot be absorbed (Kiani et al., 2022).

C. Food Digestion Process

Food is carried out by the digestive system, please recall the anatomy and physiology from the digestive system. This process includes mechanical digestion carried out by masticatory muscles, teeth, tongue, peristalsis of the digestive tract which helps break down the food we eat becomes smaller particles besides that it is also assisted by chemical digestion carried out by digestive enzymes that break down carbohydrates in food are the simplest form of carbohydrates, called monosaccharides, breaks down proteins into amino acids and breaks down fats into acids, fat and glycerol.

After food is digested into its simplest form, it is a substance particle nutrient that are formed experience absorption or absorption. Absorption of nutrients begins in stomach to intestine, absorption of nutrients can be through; 1) Passive, i.e., nutrients move from the digestive tract to the blood vessels due to differences in pressure or concentration;2) active, nutrients are absorbed using energy; 3) facilitative for example use proteins; and 4) phagocytosis/pinocytosis, which the membrane of epithelial cells that phagocytize nutrient particles. Then these nutrients are distributed to cells throughout the body and utilized by the body. So how can malnutrition arise? Process until the onset of clinical symptoms felt by the patient is a long process, for more details, consider the image below:

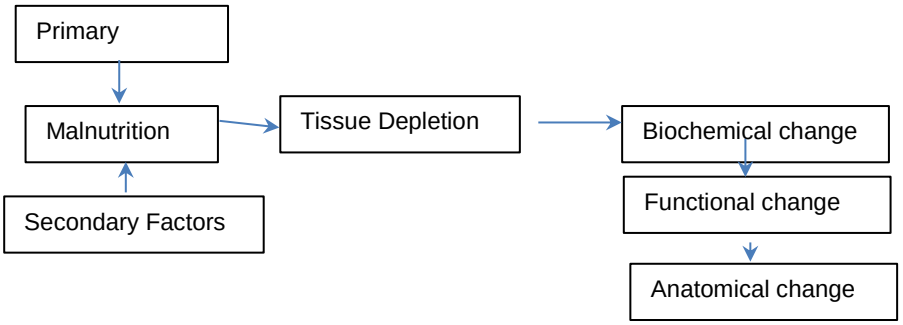

Figure 1. Development of Malnutrition

So, nutritional problems are caused by existing primary and secondary factors, both physically alone or both cause tissue depletion. There is a continuous depletion of nutrients can be known through indicators of biochemical changes. How to find out biochemical changes, for example by laboratory tests (Hb, serum albumin, serum ferritin). If the state of nutrient depletion continues, it will cause changes functional, and finally there will be anatomical changes

The effects of malnutrition on the body include; 1) unavailability of resources energy for power production; 2) disruption or stunted growth in children and youth; 3) decrease in the body's defense system due to raw materials for the defense system are nutrients, namely protein and water; 4) disruption of the structure and function of the brain, as well as; 5) Based on research results, it turns out that chronic malnutrition can cause changes behavior becomes anti-social. This state of malnutrition in children is known as disease Deficiencies of Protein Calories or Marasmus and Kwashiorkor. That is, if there is malnutrition, there is also over-nourished that also has a negative impact that can cause obesity which increases the risk of disease such as diabetes mellitus, hypertension, coronary heart disease, liver disease and gall bladder. In addition to diseases caused by undernutrition and overnutrition, related diseases with nutrition are congenital metabolic diseases, and food poisoning.

Nutritional needs consist of: 1) minimum daily nutrient requirements/minimum daily requirements (MDR) consisting of MDR when healthy is referred to as preventive MDR(ODS, 2022), namely the minimum nutritional needs needed by the body so as not to fall sick, and MDR when sick is known as MDR therapeutic, which is the minimum amount of nutrients needed by the body to heal; 2) numbers of recommended nutritional adequacy (RDA) is the level of consumption of essential nutrients considered sufficient to meet the nutritional needs of almost all healthy people. In determining the RDA, it is necessary to pay attention to the factors that influence the RDA, which includes; community nutritional health level to be achieved, community economic level, age group, gender, physical activity, and special physical conditions (e.g., pregnant/breastfeeding). The nutritional needs of the RDA are the average nutritional needs of the group age by sex in general. Specifically, the nutritional needs of each individual are very varied. As a guideline for the community in achieving balanced nutrition Balanced Nutrition General Guidelines (PUGS in Bahasa) are established which are basic guidelines regarding balanced nutrition structured as a guide for food consumption behavior in the community. The recommended energy sources according to the PUGS are 60-75% comes from carbohydrates, 10-15% comes from protein, and 10-25% comes from fat.

CHAPTER TWO
TYPES OF NUTRIENTS

Overview

We can't anticipate good performance if we don't use high-grade fuel. To maintain a healthy weight and sleep cycle, a wise diet is necessary. To ensure optimal health, reproduction, and growth, one must ensure they consume the proper nutrients in the appropriate amounts. There are several substances that the human body either cannot make or cannot manufacture in large enough amounts. These are known as nutrients, and they can be found in a variety of meals. These nutrients are divided by the World Health Organization into two main categories:

a. Carbohydrate

Carbohydrate are organic compounds composed of the elements carbon (C), hydrogen (H), and oxygen (O). Carbohydrates are abundant in plants and animals. In plants CO2 + H2O synthesis will produce starch/cellulose through the process of photosynthesis. There are so many foods that we eat every day is a source of carbohydrates such as: rice/rice, cassava, tubers, wheat, sago, corn, potatoes, and some other fruits. The general formula for carbohydrates is CnH2nOn, an example of the chemical composition of carbohydrates as follows:

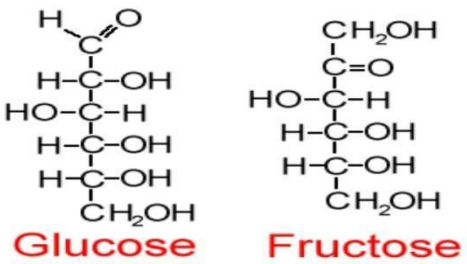

Figure 2. Chemical Composition of Glucose and Fructose

Functions of Carbohydrate

1. **Source of Energy**

The main function of carbohydrates is to provide energy for the body. Carbohydrate is the main source of energy for the entire population of the world because it is relative affordable and easy to obtain (Health, 1989). Each gram of carbohydrates produces 4 Kcal. The existence of carbohydrates in the body, some are in the blood circulation as glucose, partly present in the liver and muscle tissue as glycogen, and partly as again the rest is converted into fat and then stored as energy reserves in fat tissue. Obesity is one result of too much consuming carbohydrates.

2. **Add More Taste in Food**

The next function of carbohydrates is to give food a sweet taste, in particular monosaccharides and disaccharides. Sugar doesn't have the same sweetness, and fructose is the sweetest type of sugar.

3. **As Protein Saver**

If the need for food carbohydrates is not sufficient, then protein will be used as a food reserve to meet energy needs and replace Its main function as a substance builder. This applies, vice versa, if necessary sufficient carbohydrates, then the protein will only carry out its main function as substance builder

4. **Excretion Process**

Carbohydrates can help the process of removing feces by regulating them intestinal peristalsis, this is obtained from cellulose in dietary fiber that functions regulate intestinal peristalsis(Dhingra *et al.*, 2012). Fiber in food can help prevent obesity, colon cancer, diabetes mellitus, and related coronary heart disease with high cholesterol. The lactose found in milk can help calcium absorption. Its presence lingers longer in the gastrointestinal tract this is beneficial because it promotes the growth of good bacteria.

Types of Carbohydrate

Carbohydrates can be divided into 2 types of carbohydrates Called: simple & complex.

a. Simple carbohydrates

Simple Carbohydrates are carbohydrates that consist of one or two sugar molecules. It is a source of energy that the body processes quickly. The simpler chemical structure of the molecule makes simple carbohydrates digested by the body more quickly. Because they are digested more quickly by the body, simple carbohydrates can increase a person's blood glucose levels quickly sometime after consumption. Simple carbohydrates consist of:

1. Monosaccharides

   Monosaccharides are a type of simple carbohydrates consisting of 1 ring group. For examples are glucose (e.g., fruits, vegetables, corn syrup), fructose (e.g., fruits and honey), and galactose (as a result of the digestive process of lactose inside the body).

2. Disaccharides

   Disaccharides are a type of carbohydrate that is widely consumed by humans in everyday life. Each disaccharide molecule will be formed by joining 2 monosaccharide molecules. Examples of disaccharides commonly used in consumption daily is sucrose which is formed from the combination of 1 molecule of glucose and fructose and lactose are also formed from the combination of 1 molecule of glucose & galactose. In food products, sucrose forms almost 99% of sugar which is commonly used in daily consumption while lactose is Carbohydrates are abundant in cow's milk.

b. Complex Carbohydrate:

Complex carbohydrates are carbohydrates that are formed by almost more than 20,000 units of monosaccharide molecules mainly glucose. Complex carbohydrates are the main source of common food ingredients consumed by humans is starch(Yang *et al.*, 2022). Starch which is also a deposit the energy in these plant cells is in the form of tiny microscopic grains. starch is contained in rice, wheat, corn, grains such as beans.

Red or green beans and many are also contained in various types of tubers such as cassava, potatoes or sweet potatoes. In

various food products, starch generally be formed from two polymers of glucose molecules namely amylose (amylose) and amylose (amylose). and amylopectin (amylopectin). The composition of the amylose and amylopectin content will be varied in food products in which food products contain. High amylopectin will be easier to digest.

Carbohydrate digestion

Digestion of carbohydrates begins in the mouth with the help of the amylase enzyme, in the stomach there is no digestion, the next process is in the small intestine, where carbohydrates are digested with the help of the enzymes maltase, sucrase and lactase. Digestive end result These carbohydrates include glucose, fructose, and galactose. Carb residue If not digested, it ferments in the large intestine. The staple food of humans on this earth is mostly carbohydrates, for example rice, corn, tubers, pasta, bread, sago, noodles.

a. Lipids

Fats or lipids are organic compounds soluble in non-polar solvents such as ethanol, chloroform and benzene, but insoluble in water. Fats contain carbon, hydrogen and oxygen. Even though these elements also make up carbohydrates, the ratio of oxygen to carbon and hydrogen is lower on fat. Because fat contains less oxygen, less calories it produces twice as much as carbohydrates in the same amount. Body get a lot of fat from the food consumed, but the body also builds some fat.

Functions of Lipid

The general functions of Lipid in the body are:

1. Lipid as Fuel

Lipid is a concentrated form of energy that provides 9 calories cal/gram – twice the number of calories provided by carbohydrates and protein. Will however, fat is not the preferred fuel source for the body because it is more difficult metabolized.

2. **Supplying essential fatty acids**

Fat in food provides essential fatty acids: linoleic acid and alpha-linolenic acid. These two fatty acids are considered essential because the body cannot make it. Essential fatty acids are important for maintaining a healthy culture, supporting normal growth in children, and maintaining healthy immune function.

3. **Human cushion layer**

Lipid tissue cushions and protects vital organs by providing a layer of supporting fat to absorb mechanical impact. Examples of organs supported by fat are the eyes and kidneys.

4. **Lubricates body tissues**

The human body makes oil in the sebaceous glands. Secretions from sebaceous glands lubricate the skin to slow down the loss of body fluids outside the body.

Types of Lipid

Lipid can be divided into 3 types called: simple lipid, compound lipid, and derivative lipid

a. **Simple Lipid**

Simple lipids are groups of fatty acids (often referred to original groups) with glycerol and alcohol molecules. Simple lipids could be in the form of monoglycerides, diglycerides or triglycerides (triglycerols). Triglycerides are lipids stored in the cytoplasm of adipose cells.

b. **Complex Lipid**

Complex lipids are groups of fatty acids with alcohol molecules. Complex lipids also bind to other molecules, such as phosphoric acid and certain nitrogenous compounds(Gordon, 2003). Fatty acid not only undergo the process of esterization into more complex lipid molecules, but also undergo metabolic transformation processes into new compounds known as derived lipids.

c. **Derived Lipids**

Derivative lipids are a group of lipids formed from the hydrolysis or enzymatic breakdown of complex lipids. They are also

known as "secondary" or "modified" lipids. One example of a lipid derivative is a fatty acid, which is a long chain of hydrocarbons with a carboxyl group at one end. Fatty acids come from the hydrolysis of triglycerides, which are complex lipids found in oils and fats(Ahmed, Shah and Ahmed, 2023).

Lipids Digestion

In order to be transported throughout the body, Lipid must combine with plasma proteins to form lipoproteins. Little digestion of Lipid occurs in the mouth and stomach. When duodenum, Lipid stimulates the release of the hormone cholecystokinin, which stimulates the gallbladder to release bile. Bile is an emulsifier break down the fat into small particles and reduce the surface tension of the fat so the enzymes can penetrate the fat and work more effectively. Inside the duodenum and jejunum, 95% of consumed fat is absorbed. Small fat particles are absorbed directly through the mucosal cells into the capillaries for transport to the portal vein and liver.

What about fat metabolism? In the bloodstream, triglycerides in Chylomicrons are divided into glycerol and fatty acids by lipoprotein lipase, an enzyme fat digesters found on the surface of adipose cells and other body cells. This lipid and glycerol entering cells and converted to energy or converted back into triglycerides for storage. Fat metabolism is regulated by adrenocorticotropin, epinephrine, glucagon, glucocorticoids, and thyroxine hormones Increases fat mobilization (catabolism). Insulin, another hormone, stimulates fat synthesis (anabolism). As long as not use as energy sources, lipids remain stored inside cells in adipose tissue. If it needed for to produce energy, each fat molecule is hydrolyzed to glycerol and three other fatty acid molecules. Glycerol can be converted to pyruvic acid and then to acetyl coenzyme A (CoA) that enters the Krebs cycle.

Formation of lipids from proteins and carbohydrates

Excessed amino acids can be converted into lipid with the keto acid acetyl CoA conversion. Glucose can be converted to pyruvic acid and then to acetyl CoA which is converted into fatty acids and then Lipid (in much the same way as amino acids to fat conversion).

How fat can be carried? Lipoproteins are a group of compounds that are formed body to transport lipids through the bloodstream to various parts of the body. All lipoproteins contain lipids and proteins, but the ratio varies. If protein concentration increases, the density of lipoproteins also increases. The following are four types lipoproteins: 1) Very low-density lipoproteins (VLDL), 2) Low-density lipoproteins (LDL), 3) High-density lipoproteins (HDL), 4) chylomicrons. Each type of lipoprotein has different functions.

a. Protein

Let's continue the description of protein. Protein is a macro molecule has a molecular weight of between five thousand and several million. Proteins consist of long chains of amino acids linked together in peptide bonds. Amino acid consists of carbon, hydrogen, oxygen and nitrogen elements. Several amino acids also contain the elements phosphorus, iron, sulfur, iodine, and cobalt. While the element nitrogen is the main element of protein, because it is found in all protein but not found in carbohydrates and fats. nitrogen element constitutes 16% by weight of protein(Morris and Mohiuddin, 2023)

Functions of Protein

Proteins have the following functions:

1. Provide structural support for cells

Because of proteins, the cytoplasm has a complex structure. Different microscopic techniques can be use*d to identify a vast network of* filaments, including microtubules, actin filaments, and intermediate filaments, in eukaryotic cells, which are more likely to be larger and require more mechanical support than prokaryotic

cells. Organelle distribution and cytoplasmic organization are both significantly influenced by microtubules. The mitotic spindle is also formed by them as cells divide. Actin filaments have a role in many different types of cell movement, including cell motility, muscle cell contraction, and cell division. Strong fibers called intermediate filaments act as structural supports inside cells.

2. Transport Proteins: Hemoglobin and Myoglobin

The protein found in hemoglobin and Myoglobin have role in oxygen binding, oxygen transport and photosynthesis. Hemoglobin also transports H^+ and CO^2. In addition to carrying oxygen from the lungs to tissues, hemoglobin also carries H^+ and CO^2 from tissues to the lungs and kidneys to excreted. Within cells, organic fuels are oxidized by mitochondria to form CO^2, water and other substances. Formation of CO^2 increases H^+ levels in the tissues due to hydration CO^2 gives H^2CO^3, a weak acid which dissociates to form H^+ and HCO^{3-}.

3. Aid the Biochemical Reactions of a Cell

Numerous different enzymes are used by cells to catalyze metabolic processes. Proteins called enzymes increase the likelihood that a biochemical process will occur by lowering the reaction's activation energy. As a result, these reactions move hundreds or even millions of times more quickly than they would without a catalyst. Since their substrates are highly selective, enzymes. They form a snug fit that many scientists liken to a lock and key by binding these substrates at complimentary locations on their surfaces.

Types of Protein

1. Enzyme Protein

The human cell is something very complex. It contains thousands of chemical reactions. And enzymes carry out a myriad of chemical reactions in human cells. Enzymes will read the genetic information in DNA to then form new molecules. Enzyme proteins have the task of forming enzymes or substances that will support chemical reaction processes in the human body. For example,

protein enzymes will produce enzymes that will convert fats, proteins, and carbohydrates into much simpler forms so that they are more easily absorbed.

2. Structural Protein

This type of protein has a very different function from the previous type of protein. Structural proteins will build body construction and maintain structure from the cellular level. Structural proteins will also provide support and structure to human cells. An example of a structural protein is collagen which is a major component of human skin, tendons and cartilage. There is also keratin whose function is to form structure of teeth, hair, nails and skin. On a large scale, this type of protein helps body movement.

3. Hormones Protein

The main task of hormone protein is to regulate the function and action of hormones in the human body. The hormone itself is a secretion that has a role as a chemical messenger. The chemical message will be carried through the blood. Each hormone will affect a particular cell with the aim of coordinating the metabolic processes that occur in the body. An example is the pancreas which creates the hormone insulin in order to regulate sugar levels in the blood.

4. Antibody Protein

This type of protein functions to eliminate bacteria and viruses. The main purpose of protein antibodies is to protect the body. Later, this protein will become a component that forms antibodies in the body. Thrombin and fibrinogen are two examples of antibody proteins whose function is to help blood clot, accelerate wound healing, and prevent blood loss after an injury occurs(Chapin and Hajjar, 2015).

5. Transport Protein

Transport proteins have the main function as carriers. This protein will bind and carry small molecules and atoms to all parts of the body. One example of a transport protein is hemoglobin whose function is to bind oxygen. besides to binding oxygen, hemoglobin will also carry and deliver oxygen to the parts of the body that need

it. Lipoproteins are another example of a transport protein. The main task of lipoproteins is to help transport fats or lipids in the body.

6. Binding Protein

Binding proteins have a special function, which is to store metal ions and amino acids needed by the body. Another function of binding proteins is as a food reserve. Later, this protein will provide energy when the body needs it. What are some examples of these binding proteins? One of them is the protein ferritin. Ferritin protein is able to store and control the levels of iron in the body. Iron itself is an ion that the body needs to form hemoglobin which is a component of red blood cells.

7. Activator Protein

activator protein is a protein that will help regulate the movement of the body's muscles. This type of protein can regulate the speed and strength of heart and muscles when they contract. It is also involved in the movement of nutrients within the body's cells. In addition(Alberts et al., 2002). Examples of activating proteins are actin and myosin which helps relaxation and contraction of the muscles that occur when straightening and bending the knee.

Protein Digestion

Protein digestion begins in the stomach, where pepsin breaks down some peptide linkage. Like many enzymes involved in protein digestion, pepsin is secreted in the form of inactive precursors (proenzymes) and is activated internally gastrointestinal tract (stomach). The pepsin precursor is called pepsinogen and is activated by gastric hydrochloric acid (HCl). The human gastric mucosa contains a number of related pepsinogens that can be divided into 2 distinct groups immunohistochemistry, pepsinogen I and pepsinogen II. Pepsinogen I is only found in acidic pancreatic area, while pepsinogen II is also found in the acid pancreas found in the pylorus. Pepsin hydrolyzes bonds between aromatic amino acids such as phenylalanine or tyrosine and the second amino acid, so the product of protein digestion is polypeptides that vary in size.

A gelatinase that liquefies gelatin as well found in the stomach. Chymosin is a gastric enzyme which coagulates milk, rennin is found in the stomachs of young animals, but may be absent in humans.

In the small intestine, polypeptides from digestion in the stomach are further digested by potent proteolytic enzymes of the pancreas and intestinal mucosa. Trypsin, chemotrypsin and elastase act on the interior peptide bonds in the peptide molecule and are named endopeptidases. Mucous cell brush boundary carboxypeptidases and aminopeptides are exopeptidases which hydrolyzes the amino acids at the carboxy and amino ends of the polypeptide.

Some free amino acids are secreted in the intestinal lumen, but others are secreted on the cell surface by aminopeptides and peptidases within the mucosal cell brush boundary. Several di- and tripeptides are actively transported into intestinal cells and hydrolyzed by intercellular peptidases with amino acids that enter the bloodstream. So digestion until the end of the protein into amino acids arise in 3 locations, namely the intestinal lumen, the boundary brush of small intestinal mucosal cells and cytoplasm of small intestinal mucosal cells.

b. Vitamins

Vitamins are organic compounds which is composed of carbon, hydrogen, oxygen, and sometimes nitrogen or other elements that needed in small amounts for metabolism, growth and development. This type of nutrient is an organic substance that is found in small amounts in various kinds of food. Vitamins cannot be used to produce energy.

Functions of Vitamin

Vitamins are a crucial component of a healthy diet since they may perform a vast array of tasks. Each vitamin contributes in a different way to maintaining the health of your body, from promoting wound healing to boosting your immune system. When your food is

varied and well-balanced, you probably get the appropriate amount of vitamins. Depending on various factors, some people may need to take additional vitamin supplements. For instance, persons with illnesses like Crohn's disease or celiac disease, which make it difficult to absorb a range of nutrients, may take supplements(Montoro-Huguet, Belloc and Domínguez-Cajal, 2021). The majority of vitamins come from food, making them 'essential' nutrients. Vitamins are team players; they enhance the effectiveness of other nutrients.

Types of Vitamins

Vitamins can be divided into two groups: fat-soluble and water-soluble which dissolves in water. Fat-soluble vitamins consist of vitamins A, D, E and K. While water-soluble vitamins consist of vitamin B complex and vitamin C. Fat-soluble vitamins in large doses will be harmful to the body because of the type This vitamin cannot be excreted out and will be stored in the body. Whereas water-soluble vitamins can be excreted into the urine so that large doses are not endanger health**.**

Fat-soluble vitamins consist of: Vitamin A (retinol), Sources of vitamin A. β –carotene is a precursor of vitamin A. This substance is a yellow pigment found in many plants, especially those that are yellow, red or dark green. Animals, including humans, can convert carotene into their diet into vitamin A. Humans get vitamin A mostly from foods of animal.

Originally vitamin has been formed and partly obtained from the carotene obtained from vegetables, fruits and various animal products. Foods rich in carotene includes vegetables, especially dark leafy ones such as tomatoes and carrots, and fruits especially yellow ones such as mangoes.

1. Vitamin A

Vitamin A has several very important functions for our body, including: 1) Power night vision. Vitamin A is an essential element for the formation of pigment retina, rhodopsin. Rhodopsin is the pigment that enables the eye to see in dim light. This pigment will

decompose if there is bright light. Rhodopsin regeneration can occur and requires vitamin A. 2) Maintain Epithelial tissue. Vitamin A is required to maintain the integrity of epithelial tissue and membranes mucosa. 3) Normal growth of teeth and bones. Many physical defects that attack Bones experienced by children due to lack of vitamin A consumed since childhood. So it is very necessary to consume vitamin A since childhood so that the body's growth can be optimal.

Pregnant women are at risk of experiencing vitamin A deficiency, especially during last trimester when the needs of the fetus conceived and pregnant women increase. Excess vitamins cause: osteoporosis, birth defects, liver toxicity (liver poisoning), low childbirth, premature birth. In vitamin A deficiency can cause: interference vision (Xeropthalmia), epithelial tissue damage, growth disorders.

2. Vitamin D

Vitamin D is a fat-soluble vitamin and is a sterol type prohormone. Vitamin D is a group of sterol compounds found in naturally, mainly in animals, but is also found in plants and yeast. There are two types of vitamin D, Called vitamin D2 (ergocalciferol) and vitamin D3 (cholecalciferol). Ergocalciferol is usually present in plant steroids, whereas cholecalciferol is present on animals.

The two types of vitamin D have different chemical structures, but has identical function. In fact, there are about 10 sterol derivatives that have vitamin D activity. however, ergosterol and 7α-dehydrocholesterol, are the main provitamin D which produce D2 and D3. part of Vitamin D, Cholecalciferol does soluble in water, organic solvents and vegetable oils.

Vitamin D, Vitamins D2 and D3, have antirachitic value same for humans, dogs, pigs, rats and ruminants, but on poultry, D3 is more useful than D2. Vitamin D functions in calcium-phosphorus homeostasis together with parathormone and calcitonin.

Functions

For healthy bones, muscles, and overall wellbeing, you need vitamin D. It can be obtained through food and sunlight. Without enough of it, your muscles may ache, spasm, and hurt, and your bones may become brittle and break more easily. Vitamin D also plays a role cofactor for enzymes, such as lipase and ATP-ase. Serum calcium and phosphorus levels certain important for normal bone mineralization Source of Vitamin D: Non-diet ie Humans obtain vitamin D as a result of skin exposure to ultraviolet light in sunlight. Diet that is derived from animal body tissues where vitamin D is already preformed, found in eggs, butter and fatty fish. Cod fish oil is a very rich source of vitamin D. Margarine derived from palm oil undergoes artificial fortification with vitamin D.

Deficiencies & Overdosage

Vitamin D deficiency can cause rickets, which is a bone disorder caused by a deficiency of calcium and/or phosphorus. Occurs mainly in infants or young animals. Only mammals and birds that can get rickets, Osteomalacia, a condition that characterized by partial decalcification of bone which causes the bone to become soft and fragile. This occurs in adults and animals whose bones have grown perfect, as well as experiencing thickening and swelling of the joints. Another disease that the result of a lack of vitamin D is that teeth will be damaged more easily, muscles having convulsions, abnormal bone growth which would normally be the calf of the leg form the letter O or X. The impact and consequences of excess vitamin D can increase the risk of poisoning or even the risk of death. Overdosage of vitamin D use in Nutrition Science have side effects that are not widely known(Marcinowska-Suchowierska *et al.*, 2018). such as muscle weakness, headache, deafness, loss of appetite, nausea, fatigue, vomiting, bone pain, thirst and pressure high blood pressure.

3. Vitamin E

Vitamin E needed by the body for the growth and development. Vitamin E is a fat-soluble. Vitamin E is found in four

forms called: Alpha, Beta, Gamma, and Delta Tocopherol. Pure Vitamin E is odorless and colorless. Vitamin E is destroyed on contact with oil, lead and iron. The fat-soluble nature of vitamin E makes Vitamin E is not diminished by boiling with water. Sources of vitamin E are: wheat/corn oil, vegetables, liver, eggs, butter, milk, meat, and especially from sprouts bean. Coconut and olive oils contain small amounts of vitamin E. Most oily foods also contain vitamin E. Fruits that contain vitamin E include: avocados, sunflower seeds, tomatoes. For consumption of the easiest fulfillment is eating avocados or tomatoes daily to meet the needs of vitamin E.

Functions

Vitamin E is also contained in green vegetables. The function of vitamin E, is as a fat-soluble antioxidant. Vitamin E in the phospholipids of cell membranes plays a major biological role in protects polyunsaturated fatty acids and other cell membrane components from radical oxidation free. Vitamin E may have other functions that are not related to the function as antioxidants, which are:

a) Structural function in maintaining the integrity of cell membranes,
b) Synthesize DNA,
c) Stimulate immune reactions,
d) Prevent coronary heart disease,
e) Prevent miscarriage and sterilization, and
f) Prevent menstrual disorders,

Deficiencies & Overdosage

Vitamin E deficiency disease in humans is rare, because vitamin E is present widespread in foodstuffs, deficiencies usually occur due to interference fat absorption as in cystic fibrosis and disorders of lipid transport such as betalipoproteinemia. Deficiency of vitamin E in humans causes hemolysis of the erythrocytes and can be corrected by giving additional vitamin E. Another result is a neurological disorder resulting in abnormal function of the spinal

cord and retina. Signs can be loss of coordination and muscle reflexes, as well as impaired vision and talk. Tingling in the feet, often also caused by a lack fulfillment of vitamin E. As for using vitamin E in excess can cause poisoning. However, the results are not as detrimental as with excess vitamin A, disorders of the digestive tract occur when eating more than 600 mg daily, high doses can also cause anticoagulant drug effects used to prevent blood clots.

4. Vitamin K

In 1939 the fat-soluble vitamin called vitamin K (from coagulation) was isolated. This factor is a group a compound consisting of phylokinone found in plants and menakinone contained in fish oil and meat. Menakinone can also be synthesized by bacteria in the human small intestine. Chemical properties, Vitamin K occurs in nature in two forms, both consist of a Methylnaphtaquinone ring with a side chain in three positions. Vitamins K1 (phylokinone) has a phytyl side chain and is only found in green plants. Vitamin K2 (menakinon) is a set of bonds that the side chain consists of several isoprene units. Menaquinone is synthesized by bacteria in in the gastrointestinal tract. Menadion (vitamin K3) is a synthetic form of vitamin K. Menadion consists of a naphthaquinone ring without side chains, and therefore has soluble properties water. Vitamin K is quite resistant to heat. This vitamin is not destroyed by normal cooking methods including boiling with water. Vitamin K is impervious to alkalis and light(Lee *et al.*, 2018).

Functions

It has long been known that the function of vitamin K is in blood clotting, Vitamin K turns out to be a cofactor of the carboxylase enzyme that converts protein residues in the form of glutamic acid to gamma-carboxyglutamate. proteins and these are called protein-dependent vitamin K or gla-protein. Carboxylase enzymes that use vitamin K as a cofactor is found in the membranes of the liver and bones and little else network. Gla-protein can easily bind calcium ions. It is this ability is the biological

activity of vitamin K. Vitamin K produced in the Liver, it also comes from green leafy vegetables, beans, peas, cabbage and broccoli. The greener the leaves, the higher the vitamin K. Other foodstuffs Those that contain vitamin K in smaller amounts are milk, meat, eggs, fruits and other vegetables. Another important source of vitamin K is the bacterial flora in the jejunum and ileum.

Deficiencies & Overdosage

Lack of vitamin K causes the blood cannot clot, so that if there is a wound or during surgery bleeding occurs. Lack occurs when there is interference fat absorption. Vitamin K deficiency can also occur when a person gets antibiotics while his body doesn't get enough vitamin K food. Excess vitamin K can only occur when vitamin K is given in the form excessive form of synthetic vitamin K called menadion. Symptoms of excess vitamin K is hemolysis red blood cells, jaundice and brain damage.

5. Vitamin B

Water Soluble Vitamins, consisting of Vitamin B Complex, Vitamin B complex divided into 8 types of vitamins, called:

1) Vitamin B1 (Tiamin)
   Vitamin B1 can be found in Rice, bread, cereals, wheat flour, seafood such as shrimp, crab or shellfish. The main function is to convert carbohydrates substance in food into energy. Severe vitamin B1 deficiency can cause beriberi which characterized by abnormalities in the nerves, brain and heart.
2) Vitamin B2 (Riboflavin)
   Vitamin B2 can be found in milk, cheese, chicken, broccoli, spinach, mushrooms. The main function is to Maintain healthy eyes and skin. Symptoms of vitamin B2 deficiency are reduced sensitivity to light, the chapped lips corner and skin disorders appear around the nose and lips.
3) Vitamin B3 (Niacin):
   Vitamin B3 can be found in grains, nuts, beef, mushrooms. The main function is for skin health, increase appetite, improve the digestive system as well helps converting food

into energy. Symptoms and signs of vitamin B3 deficiency are fragile skin, slippery tongue, susceptible to diarrhea or often confused.

4) Vitamin B5 (Pantothenic Acid)
   Vitamin B5 can be Found in chicken, sardines, avocado, watermelon. Together with other types of B vitamins, vitamin B5 is useful in the breakdown process of lipid, proteins and carbohydrates into energy. Another benefit is for the formation of cells red blood cells and helps produce vitamin D.
5) Vitamin B6 (Pyridoxine)
   Vitamin B6 can be found in Poultry meat, fish, beef, potatoes, tomatoes, bananas, purple fruits and green vegetables. It Required in the process of amino acids and fats synthetized. Excess consumption of vitamin B6 can cause permanent nerve damage. Vitamin B6 deficiency in infants can cause seizures and anemia, whereas in adults will arise dermatitis nerve damage (neuropathy) and confusion.
6) Vitamin B7 (Biotin):
   Biotin can be found in salmon fish, eggs, milk, cereal, bananas and peanuts. It Assists in the process breakdown of fat, protein into energy to be used by the body.
7) Vitamin B9 (Folate)
   Folate can be found in milk and dairy products, beets, liver, melon and leafy vegetables green. it responsible for cells development, forming red blood cells and prevent nerve damage to the fetus. Symptoms and signs of deficiency vitamin B9 are macrocytic anemia, and elevated homocysteine levels. Deficiency in pregnant women can cause birth defects.
8) Vitamin B12(Kobalamin)
   Kobalamin sources are beef, fish meat, liver, eggs, milk, soybeans and sea grass. It converts carbohydrates, proteins and fats into energy, maintain healthy red blood, protect nerve cells, prevent heart disease, and prevent shrinkage of the brain which can lead to decreased memory. Symptoms and

signs deficiency of vitamin B12 includes disorders of the nervous system, decreased memory, easy to confused and depressed, prone to delusions (fantasy), tired, off balance, decreased reflexes, numbness, hearing loss, anemia, loss of appetite, diarrhea, disturbances in the formation of nerve cells, nervous system damage.

6. Vitamin C

Vitamin C is a necessary vitamin that aids in the synthesis of collagen, neurotransmitters, bone, teeth, cartilage, and connective fibers. keeps the immune system healthy and releases iron for the creation of hemoglobin. It also serves as an antioxidant, which is thought to be crucial in processes that fight cancer and ageing. helps copper and iron to be absorbed. Fresh, frozen (not dry), and especially citrus and soft fruits are good sources of vitamin C. Potatoes, broccoli, spinach, kumara, sprouts, strawberries, kiwifruit, oranges and melon, blackcurrants, and guava are among foods high in vitamin C.

Deficiencies and Overdosage

You might notice that you feel generally ill with nausea and a poor appetite if your vitamin C levels are low. People who are vitamin C deficient sometimes have flu-like symptoms. Since vitamin C is necessary for iron absorption, low iron levels may be a contributing factor. Scurvy can be brought on by a severe vitamin C deficit (eating less than 7mg per day, or about one segment of an orange, for more than 4 weeks). Blood vessel and bone damage, bleeding in the hands and feet, and, in the worst cases, death are all symptoms of this disorder. Vitamin C helps your body create collagen, which is essential for having healthy skin. Lack of vitamin C can make your skin more brittle, cause bleeding gums, and affect your gum health.

The daily suggested dose for adults is 75 to 90 mg. It can be dangerous if a person consumes more vitamin C than is recommended. It may result in nausea, vomiting, diarrhea, etc.

Toxic levels of vitamin C are what cause such a disease. Sometimes vitamin C is used at larger amounts; for instance, 10 g/day is advised while trying to stop the progression of cancer. Such dosages may cause urine to become acidic, which may cause kidney stones to develop(Chambial *et al.*, 2013). It might disrupt the antioxidant-prooxidant balance in our bodies, resulting in oxidative stress that could harm cells and tissues. It may lead to iron overload (excess iron in the body) in people with blood diseases such thalassemia.

Minerals

Minerals are parts of the body that play an important role in maintenance of body functions, both at the level of cells, tissues, organs and overall body functions. Minerals are inorganic components found in the body. The best sources of minerals are animal foods, except for magnesium which is more found in many natural plant foods. Animals obtain minerals from plants and accumulate them in their body tissues. Besides, minerals come from foods of animal origin have a higher biological availability than those derived from plant foods (De Waal, Roberts and Plunkett, 2013). Animal foods contain less mineral binding agents from plant foods.

By type, minerals are divided into: 1) Organic Minerals called minerals needed and useful for our bodies, which we can get through the food we consume every day such as rice, chicken, fish, eggs, vegetables as well as fruit, or additional vitamins. 2) Inorganic minerals, namely minerals that are not needed and not useful for our bodies. For example: Black Lead (Pb), Iron Oxide (Oxidized Iron), Mercury, Arsenic, Magnesium, Aluminum or other chemical products from soil absorption and others. Based on the needs of the mineral body it is divided into 2, called 1) Macro Minerals, which is minerals needed by the body in amounts of more than 100 mg a day. 2) Micro Minerals, namely the need for less than 100 mg a day. Which include macro minerals include 1) Calcium (Ca), is the most

abundant mineral in body which is about 1.5-2% of adult body weight or approximately 1 kg.

From 99% of this amount is found in hard tissue, which are bones and teeth. The rest is calcium spread in the body. The main functions of calcium are: a) Regulating blood clotting. When injury occurs, calcium ions in the blood stimulate thromboplastin phospholipids from injured blood platelets. Thromboplastin catalyzes the conversion of prothrombin as normal part of the blood, becomes thrombin. Thrombin helps change fibrinogen, another part of the blood, becomes fibrin which is a blood clot. b) Formation of bones and teeth, c) Maintaining heart rhythm, d) Permeability of the membrane Possibly by acting as a membrane stabilizer, and transmitting ions through cell organelles. e) Growth and muscle contraction When muscles contract calcium

role in the interaction of proteins in the muscle, namely actin and myosin. When the blood calcium less than normal, the muscle cannot relax after contraction. The body stiff can cause seizures. f) Transmission of nerve impulses the food source of calcium is soft bones, cheese, milk, molasses, yogurt, whole grains, nuts, legumes and green leafy vegetables. Signs and symptoms of calcium deficiency include numbness in the arms and legs limbs, brittle fingernails, heart palpitations, insomnia, muscle cramps and osteoporosis. Signs and symptoms of calcium toxicity are kidney stones and impaired iron absorption Under normal circumstances, as much as 30-50% of calcium is absorbed by the body. Calcium absorption mainly occurs in the upper part of the small intestine, called duodenum. Ability to absorb calcium higher in males than females in all age groups. Ability absorption is also high in the growth process and decreases in the aging process. Calcium absorption is primarily carried actively by means of transport proteins calcium. Passive absorption occurs on the surface of the digestive tract. Calcium can only be absorbed when in water-soluble form and not precipitated by other food constituents. Calcium absorption is better when consumed together with food. Lactose increases absorption when sufficient lactase enzyme is available.

Fat increases food transit time through the digestive tract, thus giving more time for calcium absorption. Vitamin D increases absorption in the intestinal mucosa by stimulates production of calcium-binding proteins. Calcium which is not absorbed will excreted in the feces. The amount of calcium excreted in the urine reflects the amount of calcium absorbed. Calcium loss also occurs through sweat.

The higher the need and the more the lower the supply of calcium in the body, the more efficient the absorption of calcium. Enhancement requirements occur in growth, pregnancy, lactation, calcium deficiency and levels Physical activity increases bone density. The amount of calcium consumed affect calcium absorption. Absorption will increase when calcium is consumed decrease. Factors that inhibit the absorption of calcium is a lack of vitamin D in the active form inhibits calcium absorption.

Oxalic acid found in spinach, other vegetables and cocoa form insoluble calcium oxalate salts, which inhibit calcium absorption. Phytic acid forms insoluble calcium phosphate so it can't be absorbed. Fiber decreases absorption because it accelerates digestion of food. Stress reduces absorption efficiency and increases excretion. People who are less mobile or if they haven't got out of bed for a long time because of illness or old age lose as much as 0.5% of bone calcium in a month and cannot replace it.

Chloride (Cl), is the main anion of extracellular fluid. Chlorine is 0.15% body weight. The highest concentration of chlorine in the cerebrospinal fluid (brain and spinal cord), stomach, and pancreas. When it reacts with sodium and hydrogen, it will form a negatively charged chlorine (Cl-). Chlorine is absorbed through the intestines and excreted in urine and sweat together with sodium. Chlorine coexists with sodium in table salt. Some vegetables and fruits are source of chlorine. The main function of chloride is the balance of fluids, electrolytes, acids and bases osmotic pressure. Food sources of chloride are fruits, vegetables and salt table. Signs and symptoms of chloride deficiency are disturbances in the acid-base balance. No signs and symptoms of toxicity. Magnesium is the

second most abundant cation after sodium in the intercellular fluid. Magnesium naturally is part of leaf chlorophyll. The role of magnesium in plants is for respiration. Function The main components of magnesium are acid-base balance, metabolism, protein synthesis, and relaxation muscles, cellular respiration and transmission of nerve impulses.

Food sources of magnesium are green leafy vegetables, nuts, seafood, cocoa and whole grains. Signs and symptoms magnesium deficiency i.e., confusion, disorientation, nervousness, irritability, rapid pulse, tremors, loss of muscle control and neuromuscular dysfunction. Signs and symptoms of toxicity is cardiac arrhythmias, hypotension and respiratory failure. Approximately 60% of 20-28 mg magnesium in the body is in the bones and teeth, 26% in the muscles and the rest is in other soft tissues and body fluids. Main source of magnesium are green vegetables, ground cereals, seeds and nuts. Meat, milk and as a result, chocolate is also a good source of magnesium.

Phosphorus is the second most abundant mineral in the body is 1% of body weight. Approximately 85% phosphorus in in the body is present as insoluble calcium phosphate salts thereby giving strength and stiffness in bone. As a phospholipid, phosphorus is a component cell wall structure. As an organic phosphate, phosphorus plays an important role in the reaction relating to the storage or release of energy in the form of Adenine Triphosphate (ATP).

Phosphorus can absorb efficiently as free phosphorus in the intestine after hydrolyzed and released from food by alkaline phosphatase enzymes and actively absorbed and passive diffusion. Other dietary factors that block the absorption of phosphorus are Fe++, Mg++, unsaturated fatty acids and aluminum-containing antacids, because water-insoluble salts. The main function of phosphorus is to form bones and teeth, cell growth and repair. The food source of phosphorus are eggs fish, grains, meat, poultry, cheese, and milk products.

Potassium has the main functions of fluids and electrolytes are muscle contraction, transmission of nerve impulses, growth rapid response, fluid distribution, osmotic pressure balance, acid-base balance. Food sources of legumes, nuts, green leafy vegetables, dairy products. Sign deficiency symptoms muscle weakness, paralysis, anorexia, confusion, weak reflexes, slow and irregular heartbeat while signs and symptoms of toxicity are heart problems, paralysis. Potassium is absorbed easily in the small intestine. As much 80-90% of ingested potassium is excreted in the urine, the rest is excreted in the feces and sweat and gastric juices. Potassium is excreted in ionic form replaces sodium ions through an exchange mechanism in the renal tubules. 35-40% sodium is in the skeleton body. Gastrointestinal fluids, like bile and pancreatic fluids, contain large amounts of sodium. Sodium has the main function of maintaining cell fluid levels, muscle contraction, acid-base balance, cell permeability, muscle function, transmission of nerve impulses. Sodium can be found, mainly from seafood, cheese, milk, salt. Adult Required 500 mg sodium. Sign and symptom of sodium deficiency is loss of appetite, gas in the intestine, muscle atrophy, vomiting, weight loss.

Signs and symptoms toxicity are edema, and increased blood pressure. Almost all of the sodium consumed (3 to 7 grams daily) is absorbed mainly in the small intestine. Absorbed sodium is carried by blood to the kidneys. Here sodium is filtered and returned to the bloodstream, in the same amount enough to maintain sodium levels in the blood. Excess sodium reaches 90-99% of what is consumed, is excreted in the urine. Sodium expenditure is regulated by aldosterone, which is secreted by the adrenal glands when the levels are high decreased blood sodium. Aldosterone stimulates the kidneys to reabsorb sodium. Under normal circumstances, sodium is excreted in the urine parallel to amount of sodium consumed. The amount of sodium in the urine is high when consumption and vice versa.

Sulfur is part of the essential nutrients, such as the vitamins thiamine and biotin, as well as the amino acids methionine and

cysteine. Sulfur especially found in the cartilage of the skin, hair and nails, which contains a lot of tissue. The main function of sulfur is the synthesis of collagen, the formation of vitamins B, enzyme and energy metabolism, blood clotting. Sulfur is absorbed as part of amino acids or as inorganic sulfates. As part of an amino acid methionine and cysteine, sulfur is also part of the glutathione as well as various enzymes coenzymes and vitamins, including coenzyme A. In the oxidized form sulfur is linked with mucopolysaccharides which has a role in dissolving metabolic waste so that they can excreted in the urine.

Sulfur is mostly excreted through the urine as free ions. It is one of the intracellular electrolytes contained in the plasma. Sulfur can be found in milk, meat, legumes, eggs. There isn't any recommendations for sulfur needs in adults. There are no signs and symptoms of deficiency or toxicity. We will not lack sulfur if the food contains enough protein (Nimni et al., 2007).

Water

Water or body fluids are the main part of the body, 55-60% of the adult body weight or 75% in infants absorb body fluids. The older the body the more reduced body fluids, men's body fluids are more than women because of the body's muscle content more fluid(Popkin, D'Anci and Rosenberg, 2010). Body fluids are the media for all chemical reactions in cells. Body fluid consists of intracellular fluid and extracellular fluid.

The function of water in body processes is 1) Solvent and transport of nutrients, 2) Catalyst in various biological reactions, 3) Growth facilitator, 4) Body Temperature regulator, and 5) shock protection for organs inside the body. Body fluid balance is balance between the amount of fluid in and out of the body. Through this mechanism the amount of body fluids will always be constant, lack of fluids will cause dehydration. Otherwise, fluid excess will cause water intoxication.

Regulation of body fluid consumption is regulated by 1) thirst and satiety, 2) regulation of fluid balance & body temperature in the hypothalamus, and 3) gastric nerves also regulates drinking. Regulation of body fluid excretion is regulated by the kidneys and brain. Sources of water can be found in almost all food Contain water. Most fruits and vegetables contain up to 95% water, whereas meat, chicken and fish contains up to 70-80%.

Water is also produced in the body as a result energy metabolism. Regulation of fluid and electrolyte balance is carried out through regulation of osmotic pressure, proteins in the cell membrane also regulate the ions & other materials through the cell wall, the Sodium Potassium Pump maintains electrolytes balance, regulation of the body's electrolyte concentration is also carried out by the digestive tract and kidneys. Fluid & electrolyte imbalance occurs when vomiting, diarrhea, diaphoresis, burns, etc.

Exercises

1) mention the types of nutrients!
2) What are the nutrients that produce energy?
3) mention group of vitamins, based on their solubility!
4) Give examples of minerals needs in large quantities!
5) What organ regulates the balance of body fluids?

Summary

Carbohydrates are organic compounds consisting of the elements carbon (C), hydrogen (H), and oxygen(O). Function of carbohydrates is as source of energy, giving sweet taste in food, save protein, regulate fat metabolism, help Feces excretion. Fats are organic compounds that are soluble in non-polar solvents such as ethanol, chloroform and benzene, but insoluble in water. Fats contain carbon, hydrogen and oxygen. The general function of fat in the body is to produce concentrated energy which provides calories of 9 cal/gram.

Protein consists of long chains of acids. Amino acids linked together in peptide bonds. Amino acids are made up of elements

carbon, hydrogen, oxygen and nitrogen, Nitrogen is the main constituent of protein, protein quality is determined through: Biological Value (NB), Net Protein Utilization (NPU), Protein Efficiency Ratio (PER), and Chemical Score (Amino Acid Score). Vitamins are organic compounds which is composed of carbon, hydrogen, oxygen, and sometimes nitrogen or other elements that needed in small amounts for metabolism, growth and development to run normal.

Vitamins can be divided into 2 groups, the water-soluble and fat- soluble. Minerals based on needs are classified into macro minerals and micro minerals.

Test

Choose the correct answer!

1) The end result of protein digestion is:
   A. Glucose
   B. Fructose
   C. Amino acids
   D. Fatty acids
2) Deficiency of vitamin B1 (Thiamin) can causes:
   A. Rickets
   B. Beriberi
   C. Scorbut
   D. Osteomalaci
3) Deficiency of Niacin (Vitamin B3) causes disease:
   A. Pellagra
   B. Rickets
   C. Scorbut
   D. Xeropthalmi
4) Vitamins that can be synthesized by microbes/bacteria in the small intestine are:
   A. Vitamin A
   B. Vitamin B
   C. Vitamin C
   D. Vitamin K

5) Vitamin K deficiency can cause:
   A. Nausea, vomiting
   B. Twilight blind
   C. Bleeding
   D. Muscle weakness
6) Minerals that has important role in forming hemoglobin in the blood are:
   A. Calcium (Ca)
   B. Magnesium (Mg)
   C. Ferrum (Fe)
   D. Potassium (K)
7) Which of the following is not a type of nutrient?
   A. Carbohydrates
   B. Vitamins
   C. Fat
   D. Medicine
8) Which of the following nutrients which doesn't produce energy?
   A. Fat
   B. Carbohydrates
   C. Proteins
   D. Vitamins
9) Which of the following vitamins are included in water-soluble vitamins?
   A. Vitamin A
   B. Vitamin C
   C. Vitamin D
   D. Vitamin K
10) Which of the following minerals are categorized as micro minerals?
   A. Chloride
   B. Sodium
   C. Potassium
   D. Iodine

CHAPTER THREE
NUTRITION NEEDS IN PARTICULAR CONDITIONS

Overview

Humans always need food to survive. In healthy condition, we eat in order to maintain health and to avoid illness. If we've got a disease, we also need food to recover. Most of the healing process of the disease is determined from food factors and body condition as a result of food consumption. If you can manage food properly, then food will help the process of recovering from illness, on the other hand if the habit is not good, it will cause the disease to get worse. Each disease has different characters so that the eating arrangements or diet on each disease is also different. Dietary adjustments depend on the pathophysiology of the disease and function of nutrients so that there is maximum utilization of nutrients contained in food in supporting the physiology of the body to fight disease, so nurses also need to learn and understand about diet in these various diseases in order later can help patients in recovery condition.

Types of Diet and Relationship with Disease

Patients who are being hospitalized which suffer from various diseases with so many disease classifications, so for each patient the food is eaten according to the condition of the disease. For general food standards, it is known that there are several types of food, which are: ordinary food, soft food, food strain, and liquid food.

1. Regular Food

This food is the same as the daily food which is various, varied with normal shape, texture, and aroma. The food arrangement refers to Nutrition Adequacy Rate which are recommended for healthy people. Ordinary food is given to patients who, based on their illness, do not need it special food (diet). Although there are no special restrictions, food is better given in a

form that is easily digested and does not stimulate the digestive tract e.g., not too much seasoning, not too spicy or salty. Examples of patients who get common types of food such as conjunctivitis without fever, skin diseases that are not allergic, low back pain, diseases of the nose, ears and throat (ENT) that do not require surgery.

The food ingredients can be processed and become processed food given to patients consists of three main meals (morning, lunch, and dinner) and one snack time at 10.00 AM. Examples of the menu for breakfast are rice, omelette, sliced cucumber & tomato, green bean porridge at 10.00 am, continue to lunch with rice, pickled fish, tempeh bacem, tamarind vegetables and papaya fruit, dinner can also with rice, stewed meat, fried tofu, vegetable soup and bananas.

2. Soft Food

Soft foods are foods that have a texture that is easy to chew. swallowed, and digested compared to regular food. This food contains enough nutrients as long as the patient is able to consume food in sufficient quantities. According to disease state soft food can be given directly to the patient or as transition from filtered food to regular food. Examples of patients who get type soft food for example: patients with swallowing and digestive disorders, or post fasting (post paralytic ileus), post gastrointestinal surgery, typhus, stroke patients with hemiparesis of the facial nerve. This soft food is given to the patient after particular surgery, patients with infectious diseases with an increase in body temperature(Kim *et al.*, 2018), patients with difficulty chewing and swallowing, as well as displacement and filter food to regular food.

3. Filtered Food

Filtered foods are semi-solid foods that have a smoother texture than soft foods so they are easier to swallow and digest. According to circumstances disease, filter food can be given directly to the patient or constitute shift from thick liquid foods to Soft Foods (O'Keeffe, 2018). Example of a patient who get a type of soft food for example: patients with swallowing disorders and digestion, or

post fasting (post paralytic ileus), post gastrointestinal surgery, typhus, stroke patients with hemiparesis of the facial nerve.

Filtered food is given to post surgery patient, patients with acute infections including gastrointestinal infections, as well as to patients with difficulty chewing and swallowing, or as displacement from viscous liquid food to soft food. Because of lack fiber and vitamin C, filtered food should be given for a period of 1-3 days only.

An example of a filter food menu, in the morning the patient is given porridge, half-boiled egg, milk and tomato juice, at 10.00 am patient given smooth green bean porridge, in teh lunchtime the patient's given rice flour porridge, stew meat, tofu porridge, papaya juice, followed by cornstarch pudding at 16.00 pm. Dinner is given rice flour porridge, gadon meat, soft, orange juice, and 08.00 pm given milk.

4. Liquid Food

Liquid food is food that has a liquid to thick consistency. This food is given to patients who have problems chewing, swallowing, and swallowing digest food caused by decreased consciousness, high temperature, nausea and vomiting, post gastrointestinal bleeding, and pre- and post-surgery. Food can give orally or parenterally. According to food consistency, Liquid Foods consist There are three types, which are clear liquid food, full liquid food, and thick liquid food(Huber and Riddlesperger, 2022). Examples of patients who get this type of food soft for example: stroke patients with hemiparese on the facial nerve, patients with loss of consciousness using a naso-gastric tube (NGT). Sample menu for patients in the morning they are tea, at 10:00 am with green bean porridge, at noon clear broth and orange juice, at 16.00 tea and at evening the patient is given clear broth and orange juice.

A. Diet in Heart and Blood Vessel Disease

Diseases of heart and blood vessels begin with changes in the lipid fraction in the blood plasma or dyslipidemia. Dyslipidemia is a disorder of lipid metabolism sign by increase or decrease in the

lipid fraction in plasma. Abnormalities of the lipid fraction is the increase in total cholesterol levels, especially LDL (low density lipoprotein) and blood triglycerides, and decreased levels of HDL cholesterol (high density lipoprotein). This is predisposing factor for atherosclerosis or coronary heart disease. According to its density, cholesterol consists of: 1) VLDL (very low-density lipoprotein), 2) Triglycerides, 3) LDL 4) HDL. Management of risk factors includes controlling blood lipids and lipoproteins, total cholesterol, and total triglycerides.

LDL is the main cause of atherosclerosis which is the beginning of coronary heart disease, so it is often referred to as bad cholesterol, while HDL has nothing to do with atherosclerosis so it is often referred to as good cholesterol. From the results of research has It has been proven that there is a positive direct correlation between total serum cholesterol levels with the incidence of Coronary Heart Disease (CHD).

In general, dietary factors associated with CHD is the consumption of saturated fatty acids, countries with high saturated fatty acid intake and

high serum cholesterol level has high mortality due to CHD as well. Every 1% increase in SFA of total energy will increase plasma cholesterol levels by 2.7 mg/dl, but it is also associated with the development of coronary artery disease in man. Replacing the SFA (Saturated Fatty Acid) diet with MUFA (Monounsaturated Fatty Acid) and alpha linolenic acid as well as increasing consumption of fruits & vegetables will prevent fatal CVD (Cardio Vascular Disease) attacks in people who have diagnosed. Another dietary factor is the consumption of trans fatty acids. The main source foods with high trans-fat are stick margarine, commercial high-fat fried food as well as baked foods with fat/butter.

The next dietary factor is the amount of fat in the diet. The amount of total dietary fat intake is related to obesity which become factor for atherosclerosis. The recommendation from the AHA (American Heart Association) is the amount of total fat consumption should less than 30% of total calories. Another dietary factor is

dietary fiber. Water soluble fiber such as pectin, gums, mucilage, algal polysaccharides & some hemicelluloses can decrease cholesterol serum. There was a decrease in LDL cholesterol by 14% in people hypercholesterolemia and 10% in normocholesterolemic people when soluble fiber added to their low-fat diet. The mechanism of this reduction is thought to be related with blood bile acids, then bacteria in the intestine which fermenting fiber to produce acetate, propionate and butyrate which inhibit cholesterol synthesis. Recommended consumption is 25 to 35 grams daily in adults, of which 6 to 10 grams of which must come from soluble fiber. Soluble fiber can be found in foods like seeds, nuts, fruit (orange, apple) strawberry & many

vegetables, while insoluble fiber is found in foods like whole grains & produce wheat, vegetables & wheat bran.

a. *Dislipidemia Diet*

The goals of the Dyslipidemia Diet are:

1) to lose weight if you are overweight,
2) changing the type and intake of dietary fat,
3) lowering intake of dietary cholesterol, and
4) increase intake of complex carbohydrates and decrease intake of carbohydrates simple. This dietary intervention is intended to achieve a healthy eating pattern.

The conditions for the Dyslipidemia Diet are:

1) the energy needed is adjusted according to body weight and physical activity,
2) Moderate fat, <30% of total energy requirements. Saturated fat for Stage I Dyslipidemia Diet, <10% of total energy requirements and for Diet Dyslipidemia Stage II, <7% of total energy requirements. Monounsaturated and polyunsaturated fats recommended 10-15% of total energy needs with cholesterol level in the ingredients food < 300 mg for Diet Dyslipidemia Stage I, and < 200 mg for Diet Dyslipidemia Stage II,

3) Adequate protein, which is 10-20% of total energy needs. Source of protein of animal origin, especially from fish which contain lots of omega-ʒ fats. Source of vegetable protein are preferred.
4) Moderate carbohydrates, about 50-60% of total energy needs.
5) High fiber, especially water-soluble fiber found in apples, mashed rice, brown rice, oatmeal and nuts,
6) Vitamins and minerals are sufficient. Multivitamin supplement recommended for patients who consume <1200 kcal of energy a day.

There are 2 types of diets for Dyslipidemia

1) Diet for Dyslipidemia Stage I, contains higher cholesterol and saturated fat,
2) 2) Dyslipidemia Diet Stage II, contains less cholesterol and saturated fat.

If the patient is found to be suitable with the phase I diet, then immediately given the phase II diet, if not the diet must be started with Stage I first. The success of the diet begins with measuring blood cholesterol levels after 4-6 weeks and after 3 months. If the goal of diet therapy is not achieved after 3 months, it is necessary to assess the patient's acceptance and adherence to this diet, if the goal treatment is not reached at the appointed time, the patient needs to be consulted again with a dietitian.

The recommended food consists of carbohydrate sources, which are rice, especially mashed rice, brown rice, macaroni, high fiber bread, cereals, sweet potatoes, potatoes, homemade cakes by using a little unsaturated oil/fat, sources of animal protein, namely fish, lean meats, skinless poultry, egg whites, skim milk, low-fat yogurt and cheese. Sources of Vegetable Protein consist of tofu, tempeh, and nuts.

Food ingredients that are not recommended are sources of carbohydrates including, fatty cracker biscuits, fatty pastries, sources of animal protein include fat meat, mutton, offal, brains,

sausages, egg yolks (limited to 3 pieces per week), sweetened condensed milk, ice cream, Vegetable protein sources include cooked with thick coconut milk and fried in palm oil, vegetables such as those cooked with butter and palm oil and thick coconut milk, i.e. fruit preserved oils, namely coconut oil, palm oil, butter, coconut margarine, coconut cream.

b. Heart Disease Diet

Heart disease occurs due to a continuous process, where the heart gradually loses its ability to function normally. At the early stage of the disease, the heart is able to compensate for inefficiencies in its function and maintain normal blood circulation through enlargement and increased pulse (Compensated Heart disease). In an uncompensated state (*Decompensatio Cordis*), abnormal blood circulation causing shortness of breath (dyspnea), tiredness, and chest pain. Reduced blood flow can cause abnormalities in kidney function, liver, brain, and blood pressure, which results in sodium resorption(Tian and Liang, 2021). It is finally cause edema. Heart disease becomes acute when accompanied by infection (endocarditis or Carditis), Heart failure, after Myocard Infarct, and after heart surgery. The purpose of the heart disease diet are:

1) provide sufficient food without burden the heart,
2) lose weight if too fat.
3) prevent or remove salt or water deposits.

The conditions for a heart disease diet are as follows

1) enough energy, for achieving and maintaining normal body weight,
2) sufficient protein, namely 0.8 g/kg BW,
3) moderate fat, which is 25-30% of total energy needs, 10% comes from saturated fat, and 10-15% unsaturated fat,
4) low cholesterol, especially when accompanied by dyslipidemia (see Dyslipidemia Diet),

5) sufficient vitamins and minerals. Avoid using supplements potassium, calcium, and magnesium if not needed,
6) low salt, 2-3 g/day, if accompanied by hypertension or edema,
7) easily digestible food and does not cause gas,
8) enough fiber to avoid constipation,
9) enough fluids, approximately 2 liters/day is appropriate according to needs,
10) forms of food adapted to the state of the disease, are given in small bangs,
11) if nutritional needs cannot be met through food can give additional food in the form of enteral, parenteral, or nutritional supplements.

Types of Diet and Indications for Administration:

1. Cardiac Diet I, the heart diet I is gave to heart disease patients such as Myocard Infarct (MCI) or severe Decompensation Cardis. Diet given in 1-1.5 liters of fluids/day for the first 1-2 days if the patient can accept it. This diet is very low in energy and high in all substances, preferably only given for 1-3 days.
2. Cardiac Diet II, Heart Diet II is given in filtered or soft foods. The diet is given as a transition from the cardiac diet I, or after the acute phase is resolved. If accompanied by hypertension and/or edema, given as Low salt diet. This diet is low in energy, protein, calcium and thiamine.
3. Cardiac Diet III, Cardiac Diet III is given in soft or regular food. Diets are given as a transition from diet II or for patients with mild heart conditions. If accompanied by hypertension and/or edema, given as low salt. This diet is low in energy and calcium, but enough other nutrients.
4. Cardiac Diet IV, The IV Cardiac Diet is administered in the form of a regular meal. The diet is provided as a transition from cardiac diet III or to heart patients with mild conditions. If accompanied by hypertension and/or edema, administered as

a low salt diet. This diet quite have enough energy and other nutrients, except calcium.

c. *Stroke Diet*

Stroke or cerebrovascular disease is damage to the part of the brain that occurs when the blood vessels that carry oxygen and nutrients to the brain clogged or broken. As a result, several related disorders can occur with the patient's ability to eat which ultimately results in a decrease in nutritional status. To overcome these conditions required a special diet.

The goals of the stroke diet are:

1) Provide enough food to fulfill nutritional needs of patients with regard to the state and complications of the disease,
2) Improve stroke conditions, such as dysphagia, pneumonia, kidney disorders, and decubitus,
3) Maintain fluid and electrolyte balance.

Requirements of Stroke Diet are:

1) Enough energy, about 25-45 kcal. In the acute phase, energy given 1100-1500 kcal/day,
2) Adequate protein, namely 0.8-1 g/kgBB. If the patient in a state of malnutrition, protein is given 1.2-1.5 g/kg BW. When disease accompanied by complications of Chronic Kidney Disease (CKD), given low protein, about 0.6 g/kg,
3) Adequate fat, which is 20-25% of total energy needs. Unsaturated fat is preferable, limit fat sources, about <10% of total energy needs. Cholesterol limited to <300 mg,
4) Carbohydrates are sufficient, namely 60-70% of total energy needs. for patients with diabetes mellitus preferably complex carbohydrates,
5) Vitamins are sufficient, especially vitamins A, riboflavin, B6, Phosphoric acid, B12, C, and Vitamin E
6) Adequate minerals, especially calcium, magnesium, and potassium. The use of sodium is limited by giving table salt a maximum of 1 ½ teaspoon/day

7) Enough fiber, to help lower levels blood cholesterol and prevent constipation,
8) Enough fluids, about 6-8 glasses/day, except on edema and ascites, fluid is limited. Drinks should be given after meal so that the portion of food can be spent. For patients with dysphagia, fluids are administered carefully. Liquids can be thickened with gel or guarcol.
9) Form of food adapted to the patient's condition,
10) Food is given in small portions and often.

Based on the stages, the stroke diet is divided into two phase, which are:

1. Acute phase (24-48 Hours), Acute phase is a state of unconsciousness or decreased consciousness. In this phase parenteral food is given (nothing per oral/NPO) and followed by enteral feeding (naso-gastric tube/NGT). Total parenteral feeding therapy needs to be closely monitored. Fluid Excess can cause cerebral oedema. Energy demand for total NPOs is AMB x 1 x 1.2; proteins 1.5 g/kg BW; maximum fat 2.5 g/kg BW; maximum dextrose 7 g/kg BW.
2. Recovery Phase, The recovery phase is the phase in which the patient is conscious and doesn't have difficulty swallowing (dysphagia). Food is given by oral gradually in the form of liquid food, filter food, soft food, and regular food.

According to the phase of the disease, given a stroke diet I or II. Stroke Diet I. Stroke diet I is given to patients in the acute phase or if any swallowing dysfunction(Wirth *et al.*, 2013). Food is given in the form of condensed liquid or a combination of clear and viscous liquid given orally or with NGT according to the state of the disease. Food given in small portions every 2-3 hours; the duration of feeding based on patient's condition.

Exercise

To deepen your understanding of the material above, do some exercises
following!

1) What is the goal of diet in dyslipidemia?
2) Name the food sources of carbohydrates that are not recommended for heart disease patient
3) What are the dietary requirements for stroke?

Summary

Risk factors for CHD category I consist of:

1) cigarette smokers,
2) high LDL cholesterol,
3) Hypertension,
4) Platelet Abnormalities.

Risk factors for CHD category II consist of:

1) Patients with Diabetes Mellitus,
2) Less Physical activity
3) Abnormal HDL cholesterol
4) obesity, and
5) menopausal status.

CHD risk factor category III consists of

1) Psychosocial factors,
2) Abnormal Triacylglycerol/Triglycerol,
3) Experiencing oxidative stress,
4) Alcohol consumption.

CHD category IV risk factors consist of

1) Age factor,
2) Gender,
3) Family history of CHD.

In general, dietary factors associated with CHD are consumption of saturated fatty acids, consumption of trans fatty acids, amount of fat in food. dietary fiber, alcohol, anti-oxidants, minerals, and soy protein diet. Dyslipidemia is a disorder of lipid metabolism characterized by an increase or decrease in the fraction lipids in plasma. There are 2 types of dyslipidemia diets, namely the Stage I Dyslipidemia Diet and Stage II Dyslipidemia Diet. The purpose of the Heart Disease Diet are:

1) Providing food enough without burdening the work of the heart.
2) Losing weight if too much fat.
3) Prevent or eliminate the accumulation of salt or water. Stroke or illness cerebral circulation is damage to the part of the brain that occurs when blood vessels which carry oxygen and nutrients to the brain is blocked or ruptured.

Test

Instructions: Choose the most correct answer

Case question no 1 s. d 5:

Mrs. M, 42 years old, came to polyclinic for routine cholesterol checks blood, no complaints yet, vital signs: BP = 125/70 mmHg, Pulse = 80x/min, Weight = 75 kg; Height = 151 cm, laboratory examination results obtained: Total cholesterol = 210 mg/dl; LDL cholesterol = 160 mg/dl; HDL cholesterol = 50 mg/dl

1) What is the recommended LDL cholesterol level for Mrs. M to be reduced through low fat diet plan?
   A. 130 mg/dl
   B. 145 mg/dl
   C. 150 mg/dl
   D. 160 mg/dl
2) What are the risk factors for Mrs. M which can cause current illness?
   A. being overweight
   B. hypertension
   C. high cholesterol in the blood
   D. hereditary factor

3) With Mrs. M's condition, what disease can be suffered early if the risk factors are not controlled?
   A. hypertension
   B. coronary heart
   C. Kidney failure
   D. heart failure
4) Which of the following types of food should Mrs. M avoid?
   A. fried chicken, beef brain curry
   B. fried catfish, tempeh bacem
   C. petis tofu, anchovy sauce
   D. Scrambled long beans, tofu pong
5) What is the right diet advice for Mrs. M?
   A. Increase consumption of simple sugars
   B. reduce fat-containing foods
   C. reduce fruit intake
   D. increase carbohydrate intake

B. Diet in Digestive Tract Disease

The digestive tract is the channel that functions to digest food, absorb nutrients, and excreting digestive wastes. The digestive tract consists of mouth, esophagus, stomach, small intestine, large intestine and anus. Indigestion and absorption can occur in the process of swallowing, emptying the stomach, absorption of nutrients, and the defecation process. These disorders occur due to infection or inflammation, motility disorders, bleeding or hematemesis melena, post-gastrointestinal conditions surgery, and tumors or cancer. Diseases of the gastrointestinal tract that occur are esophageal stenosis, gastritis, hematemic-melena, peptic ulcer, gastroesophageal reflux disease (GERD), Diverticulosis, Inflammatory Bowel Disease (IBD), Hemorrhoids, Diarrhea, and Constipation. In this topic we will discuss diet in several digestive tract diseases, we start from the upper gastrointestinal tract.

a. *Dysphagia Diet*

Dysphagia is difficulty swallowing due to obstruction in the flow of food to the stomach digestive tract. This can occur due to disorders of the nervous system, swallowing, post-stroke, and presence of a tumor mass covering the gastrointestinal tract. The goals of the Dysphagia Diet are:

1) Reducing the risk of aspiration due to food intake into the respiratory tract,
2) Prevent and correct deficiencies of nutrients and fluids.

Dysphagia diet requirements are

1) Enough energy, protein and other nutrients,
2) Easy to digest, small food portions, and often given,
3) Enough fluids,
4) Depending on the form of food on the ability to swallow, given gradually, 5) No clear liquid food given because it often causes aspiration,
5) food can be given orally or through a pipe or sonde.

Types of diet and indications for administration are very dependent on the patient's condition, starting from full liquid food if through a tube or thick liquid food if taken orally, filtered food or soft food.

b. Post Hematemesis Melena Diet

Diet after hematemesis melena, which is a state of blood vomiting and defecation due to injury or damage to the digestive tract. The purpose of the diet are

1) Provide enough food that allows the gastrointestinal tract to rest, reduce the risk of re-bleeding, and prevent aspiration,
2) Strive for the best possible nutritional state.

The requirements for a post-hematemesis-melena diet are:

1) Does not stimulate the digestive tract,
2) Does not leave residue,

3) In the acute phase, only parenteral food can be given for 24-48 hours to give rest to the gastrointestinal tract,
4) Diet is given if bleeding in the stomach or duodenum was absent. Diet is given in Clear liquid food, every 2-3 hours after bleeding. The nutritional value of these foods is very low, so it is only given for 1-2 days.

c. *Gastric Disease Diet*

Gastric or gastrointestinal diseases include acute and chronic gastritis, ulcers peptic ulcer, post-gastric surgery which is often followed by "dumping syndrome" and gastric cancer(Vavricka and Greuter, 2019). Gastrointestinal disorders are often associated with emotions or psychoneurosis and fast eating due to lack of chewing and too much smoking. Disorders of the stomach are generally in the form of dyspeptic syndrome, which is a collection symptom consisting of nausea, vomiting, epigastric pain, bloating, and decreased appetite.

The goal of the gastric disease diet is to provide enough food and fluids without burdensome to the stomach, also prevents and neutralizes excess secretions of gastric acid. Diet requirements for stomach disease are:

1) Easy to digest, small and often portion
2) Energy and protein is sufficient, according to the patient's ability to receive it,
3) Low fat, which is 10-15% of total energy needs which is increased gradually according to needs,
4) Low fiber, especially fiber that does not dissolve in water which is increased gradually,
5) Sufficient food, especially if there is vomiting.
6) No contain food ingredients or sharp seasonings, either thermally, mechanically or chemical (adjusted individual acceptance),
7) Low lactose if there are symptoms of intolerance lactose, it is generally not recommended to drink too much milk,
8) Eat slowly in a calm environment,

9) In the acute phase can be given parenteral feeding only during 24-48 hours to give rest to the stomach.

Gastric diet given to patients with Gastritis, Peptic Ulcer, Abdominal Typhus, and post upper gastrointestinal surgery. Consist of

1) Gastric Diet I. Gastric diet I is given to patients with acute gastritis, pectic ulcer, postpartum bleeding, and severe abdominal typhus. Food is given in the form of strained and Give as transition from post-hematemesis-melena, or after the acute phase is resolved. Food is given every three hours for 1-2 days only, because it is boring and lacking energy, iron, thiamine, and vitamin C. Then the
2) Gastric Diet II. Gastric diet II is given as a transfer from the gastric diet I, to patients with pectic ulcers or chronic gastritis and mild abdominal typhus. Soft food, small portions also given 3 times with complete meal and 2-3 times with snacks. This food contains enough energy, protein, vitamin C, but less thiamin.

Daily Menu Distribution

Morning At 10.00

rice 30 g	= 1.25 glass
cornstarch 20 g	= 4 tbsp
chicken eggs 50 g	= 1 pcs
sugar 25 g	= 2.5 spoon
vegetables 50 g	= 0.5 glass
milk 100 g	= 0.5 glass
granulated sugar 10 g	= 1 tbsp
margarine 5 g	= 0.5 spoon

Afternoon 16.00

rice 30 g	= 1.25 glass
Bread porridge 40 g	= 2 slices

50 g meat	= 1 tablespoon
margarine 10 g	= 1 spoon
tempeh 50 g	= 2 pcs
egg 50 g	= 1 pcs
vegetables 100 g	= 1 glass
sugar 10 g	= 1 spoon
papaya 100 g	= 1 spoon
granulated sugar 10 g	= 1 spoon
margarine 10 g	= 1 spoon

Evening 20.00

rice 30 g = 1.25 glass
milk porridge 200 g = 1 glass
50 g meat = 1 spoon
sugar 10 g = 1 spoon
tempeh 50 g = 2 spoon
vegetables 100 g = 1 glass
papaya 100 g = 1 spoon
margarine 10 g = 1 spoon

d. Inflammatory Bowel Disease Diet

Inflammatory bowel disease is inflammation, especially of the ileum and large intestine with symptoms of diarrhea accompanied by blood, mucus, abdominal pain, decreased body weight, decreased appetite, fever, and steatorrhea (the presence of fat in the stool). This disease can be Ulcerative Colitis and Crohn's Disease. The goals of this inflammatory bowel disease diet are:

1) Correcting fluids and electrolytes imbalance,
2) Replacing lost nutrients and improving malnutrition status,
3) Prevent further irritation and inflammation,
4) Rest the intestines during the acute period.

The requirements for the Intestinal Inflammatory Disease Diet are:

1) In the acute phase, fasting and given parenteral food only,

2) When the acute phase is resolved, the patient should be given food gradually, starting with liquid form (oral or parenteral), then increasing to a Low Leftover and Low Fiber Diet,
3) If the symptoms disappear, food can be given normally
4) Energy requirements, called high energy and low protein or lactose free and containing medium chain fatty acids can be given because of frequent intolerance lactose and fat malabsorption,
5) Adequate fluids and electrolytes,
6) Avoid foods that can cause gases,
7) Low rest and gradually return to Regular Food. Diet type and Indications for administration, according to the symptoms of the disease, liquid food can be given, Soft, Regular, or Low Residual Diets with Modified Low Lactose or use medium chain triglyceride fats.

e. Diverticulosis Diet

Diverticulosis is the presence of small pouches that form on the wall of the colon which occurs due to high intracolon pressure in chronic constipation. This especially occurs in elderly people who eat low fiber. The purpose of the Diverticulosis diet is to:

1) Increase volume and stool consistency,
2) Reducing intraluminal pressure,
3) Preventing infection.

Dietary requirements for diverticulosis are:

1) The need for energy and nutrients,
2) High fluids, about 2-2.5 liters a day,
3) High fiber.

f. Diverticulitis Diet

Diverticulitis occurs when the buildup of food debris in the diverticular causes inflammation. Symptoms include cramps in the left lower abdomen, nausea, bloating, vomiting, constipation or diarrhea, chills and fever. The goals of the Diverticulitis Diet are:

1) Resting the intestines to prevent perforation,
2) Prevent laxative effects from high fiber foods.

The requirements for the Diverticulitis Disease Diet are:

1) Ensuring sufficient intake of energy and nutrients in accordance with the established dietary restrictions,
2) If there is bleeding, start with clear liquid food,
3) Food is given in stages, starting from the Nutritional low residual 1 diet to Low Residual II diet with appropriate consistency.
4) Avoid foods that are many contain small seeds such as tomatoes, guavas, and strawberries, which can accumulate in the diverticular,
5) If necessary, give Low or Free Lactose Enteral Food
6) To prevent constipation, drink at least 8 glasses a day. Types of diets and indications for administration according to the symptoms of the disease.

Exercise

To deepen your understanding of the material above, do some following exercises!

1) What are the dietary requirements for post hematemic melena?
2) How many types of stomach are there?
3) What is the goal of the inflammatory bowel disease diet?

Summary

Dysphagia is swallowing difficulty due to obstruction in the flow of food to the digestive tract. Post Hematemesis-Melena Diet, which is a state of vomiting and defecating large amount of blood due to injury or damage to the digestive tract. Gastric diet I was given in patients with acute gastritis, pectic ulcer, post-bleeding, and severe abdominal typhus. Gastric diet II is given as a transfer from gastric diet I, to patients with pectic ulcer or chronic gastritis and mild abdominal typhus. Inflammatory bowel disease is inflammation, especially of the ileum and large intestine with symptoms of

diarrhea accompanied by blood, mucus, abdominal pain, weight loss, decreased appetite, fever, and Steatore (fat in the stool) may occur. Diverticulosis is presence of Small pouches that formed on the walls of the colon due to high pressure in intracolon with chronic constipation. This is especially the case in elderly who eat low fiber(Rezapour, Ali and Stollman, 2018).

Test

Instruction: Choose the most correct answer

CASE FOR QUESTIONS NUMBER: 1 to 4

Mr. S, 64 years old. Came to the hospital because of nausea and vomiting, black colored feces. complaints: no appetite, feeling nauseous when eat. Inspection: Anthropometry weight = 55 kg, height = 162 cm. Physical examination: weak condition, BP 130/80 mmHg, Temperature 37° C, Eating Habits: likes to consume hot, spicy food and drinks with ice. Medical Diagnosis: Gastritis.

1) What is the ideal weight for Mr. S in the case above when using the Broca formula?
   A. 68.2 kg
   B. 62.8 kg
   C. 55.8 kg
   D. 55.2 kg
2) The type of diet given to Mr. S in the above case is:
   A. Liver diet
   B. cardiac diet
   C. low-salt diet
   D. gastric diet
3) Which food sources of carbohydrates are not recommended for Tn. S?
   A. strained/mashed rice;
   B. glutinous rice, corn, cantel, sweet potato, taro, cassava.
   C. baked bread; biscuits
   D. The flour is made into porridge/pudding.

4) What health education related to Mr. S eating behavior?
   A. reduce the habit of spicy food
   B. eat in small portions but often
   C. eat when there are no bouts of nausea
   D. eat it warm
5) What is the purpose of the diet on the Dysphagia diet?
   A. Lower the risk of aspiration
   B. gain weight
   C. preventing and correcting nutritional and fluid deficiencies
   D. to reduce fat intake

C. Diet in Surgery

The effect of surgery on postoperative metabolism depends on the severity of the surgery, nutritional state of preoperative patients, and the effect of surgery on patient's ability to digest and absorb nutrients. After surgery there is often an increase in nitrogen and sodium excretion may last 5-7 days or more postoperatively. Increased excretion of calcium occurs after major surgery, trauma to the body's skeleton, or after a long period of inactivity (immobilization). Fever increases energy requirements, whereas injuries and bleeding do increase the need for protein, iron, and vitamin C. Fluid loss is also necessary replaced.

a. Pre-Surgery Diet

The pre-surgical diet is the eating arrangement given to the patient undergo surgery. Administration of pre-surgical diet depends on:

1) patient general condition, whether normal or not in terms of: nutritional status, blood sugar, blood pressure, rhythm heart rate, pulse, kidney function, and body temperature.
2) Types of surgery. Consist of Minor surgery, such as incision, extirpation and circumcision, and major surgery, as distinguished from surgery on the gastrointestinal tract (stomach, small intestine, and large intestine) and surgery

outside the digestive tract (cardiac, renal, pulmonary, urinary tract bladder, bones, etc.

3) The nature of the operation is Immediate emergency or cito, so that the patient does not have time to be given a pre-surgical diet and planning or elective. Patient prepared by administering a Pre-surgical Diet according to nutritional status and type of surgery.
4) Types of disease consist of: The main disease that requires surgery are diseases of the gastrointestinal tract, heart, kidneys, respiratory tract, and bones. Or associated disease such as diabetes mellitus, heart disease and hypertension.

Diet Goals

The purpose of the Pre-Surgery Diet is to ensure the patient's nutritional status are in optimal condition at the time of surgery, so that reserves are available for coping with stress and wound healing.

Diet requirements,

Pre-surgery Diet requirements are

1) Energy. Includes:
   a) For patients with poor nutritional status, given as much as 40-45% kcal/kg BW.
   b) For patients with nutritional status is given as much as 10-25% below normal energy requirements.
   c) patients with good nutritional status are given according to normal energy needs plus stress factor of 15% of BMR (Basal Metabolic Rate),
   d) For patients with specific disease, energy is given according to the disease.
2) Protein, includes
   a) Divide patients with poor nutritional status, anemia, low albumin (< 2.5 mg/dl) are given high protein 1.5-2.0 g/kg BW.
   b) For patients with good nutritional status or obesity are given normal protein 0.8-1 g/kg BW,

c) For patients with certain diseases given accordingly with the disease.

3) Adequate fat i.e., 15-25% of total energy needs. For patients with certain diseases given according to the disease.
4) Enough carbohydrates
   as the remainder of the total energy requirement to avoid hypermetabolism. For patients with certain diseases, carbohydrates are given according to the disease.
5) Vitamins
   especially vitamins B, C, and K. if necessary, added in supplement form.
6) Enough minerals, if necessary, added in supplement form.
7) Low residual for easy digestive tract cleaning, so it doesn't interfere with the surgery procedure (no defecation or urination on the operating table).

Types, Indications and Duration of Diet

In accordance with the type and nature of surgery, the pre-surgery diet is given with the following indications

1) Emergency pre-surgery or cito before surgery is not given a specific diet.
2) Pre-surgery plan or Elective, for a) Minor or minor elective surgery, such as tonsillectomy and requiring special diet. The patient is fasted 4-5 hours before surgery. Whereas in patients who will undergo an appendectomy, herniotomy, hemorrhoidectomy, and so on were given a low residual diet the day before. b) Preoperative major or elective major such as: Pre-major surgery the Gastrointestinal tract is given a Low residual diet for 4-5 days, with the 4 days stages before surgery given soft food, day 3 before surgery given filter food day 2 and 1 day before surgery given low residual enteral formula. In Pre-Major Surgery patients outside the digestive tract were given low residual internal formula for 2-3 days. The last feeding in pre-major surgery is carried out during 12-

18 hours before surgery, while the last drink will give 8 hours before surgery.

b. Post-Surgery Diet

Post-surgical diet is food given to patients after undergoing surgery. Food setup after surgery depends on the kind of surgery and types of comorbidities. The goal of the Post-surgical Diet is to improve the patient's nutritional status as soon as possible, improve healing process and increase patient's endurance(Hirsch, Wolfe and Ferrando, 2021), by

1) Providing basic nutritional needs (fluids, energy, protein).
2) Replacing lost protein, glycogen, iron, and other nutrients.
3) Repair electrolyte and fluid imbalances.

Post-surgical Diet Requirements are to provide food gradually starting from liquid, soft and regular form. Feeding from stage to stage depends on types of surgery and patient conditions such as

1) Post-Minor surgery: Food trying to get back to normal or normal as soon as possible,
2) Post-Major surgery, Food is given carefully according to the patient's ability to accept it.

Types of Diet and Indications for Administration consist of:

1. Post-Surgery Diet I

This diet is given to all post-surgery patients, namely Post Minor surgery given after nausea has disappeared, while Post-Major surgery is given after waking up and the nausea is gone and there are signs that the intestines have started working. How to Feed, for 6 hours after surgery which is marked with presence of bowel sounds or flatus, food given in the form of water, sweet tea, or other liquids as in clean liquid food. This food is given in time as short as possible, because it is lacking in all nutrients. In addition, food is provided parenteral as needed. Daily food ingredients and nutritional value can be seen in clear liquid food diet. food is given

in stages according to patient ability and condition, starting at 30 ml/hour.

2. Post-Surgery Diet II

Post-surgery Diet II is given to patients with major gastrointestinal or post-surgery as a transfer from the Post-surgical Diet I. Food is given in viscous liquid form, in the form of clear broth, syrup, fruit juice, soup, milk and pudding, in average of 8-10 times a day as long as the patient is not sleeping. The amount of fluid given depending on the circumstances and condition of the patient. In addition, parenteral food can be given if needed. This diet is given for the shortest time possible because of its lack of nutrient. Daily foodstuffs and nutritional value of this diet are the same as condensed liquid food by giving gradually starting at 50 ml/hour. Food

What is not allowed in this diet is orange juice and other drinks containing carbon dioxide (tea or beverage packaging).

3. Post-Surgery Diet III

Post-surgery Diet III is given to patients after major gastrointestinal surgery oras a transfer from Post Surgery Diet II. Food is given in the form of filter food plus milk and biscuits. Fluid should not exceed 2000 ml per day. Besides that, parenteral food can be given if needed. Food which are not recommended for this diet are foods with heavy spices and drinks containing carbon dioxide. Daily food ingredients and nutritional value of this diet can be seen in filtered food added with 1 glass of milk with 20 g of granulated sugar at 16.00, at 22.00 given Biscuits 30g.

4. Post-Surgery Diet IV

Post-surgery Diet IV is given to post-minor surgery patients, after Diet I and Post-major surgery patients, after Diet III. Food is given in the form of Soft Food which is divided into 3 full meals and 1 snack. Daily food ingredients and nutritional value are the same as the diet on Soft Foods. as a substitute snacks can be given at 16.00 and 22.00 in the form of 2

fruit biscuits or 1 portion of pudding and a glass of milk. Food not recommended for this diet are foods with sharp spices and drinks containing carbon dioxide.

5. Post-surgery Diet Through Gastric Tube

The Post-Surgery Diet through a gastric tube is the provision of food for patients in a state of special conditions such as coma, burns, psychological disorders, where food must be given through a gastric or internal tube or Naso Gastric Tube (NGT). Food is given as Full Viscous Liquid Food, 1 kcal/ml, 250 ml every 3 hours when not sleeping. Food is expected to stimulate gastric peristalsis. Daily groceries and nutritional value of the post-operative gastric pipe diet can be the same as the viscous liquid food diet.

6. Post-surgery Diet Through the Jejunal Tube

Post-surgical diet through the jejunal tube is the provision of food for patients who unable to receive food by mouth or stomach tube. Food is provided straight to the jejunum. Food is given as liquid food that does not require gastric digestion and is not stimulating jejunum mechanically or osmotically. Liquid is given drop by drop slowly, so that diarrhea or cramps do not occur. This diet should be given in a short time due to lack of energy, protein, vitamins, and iron. Daily food ingredients for the Post-Surgery Diet Through the Jejunum are: Powdered milk 80 g, Maltose dextrin 20 g, Lime water (USP) 420 ml, Water 200 ml.

Exercises

To deepen your understanding of the material above, do some following exercises

1) What is the purpose of the pre-surgery diet?
2) What are the post-surgery dietary requirements?
3) What are the types of diets and Indications of post-surgery diet?

Summary

Administration of Pre-Surgery Diet depends on

1) General condition of the patient,
2) Types of surgery

3) Types of disease. The goal of the Post-Surgery Diet is to strive for the patient's nutritional status can back to normal condition, to enhance recovery process and increase the patient's immune system. The postoperative diet consists of Post-Surgery Diet I, Post-Surgery Diet II, Post-Surgery Diet III, and Post-Surgery Diet IV

Test

Instructions: Choose the most correct answer.

1) Pre-surgery diet in patients who have good nutritional status, energy is given accordingly normal energy needs plus a stress factor of what percentage of patient's Basal Metabolic Rate (BMR)?
   A. 2.5%
   B. 5%
   C. 10%
   D. 15%
2) What are the pre-surgery dietary requirements for protein requirements in patients with normal nutritional status?
   A. 0.2-0.6 g/Kg BW
   B. 0.4-0.8 g/Kg BW
   C. 0.8-1g/Kg BW
   D. 1.5-2 g/kg BW
3) What are the cases of patients with emergency surgery or cito surgery, for example in a car accident which needs surgery?
   A. The patient is not given a specific diet
   B. The patient is put on a liquid diet
   C. The patient is put on a soft diet
   D. The patient is put on a normal diet
4) What diet is given to pre-minor surgery patients such as an appendectomy or herniotomy the day before surgery?
   A. a high-calorie diet
   B. a high-protein diet
   C. Low residual diet
   D. a low salt diet

5) How do I order a pre-surgery diet?
   A. soft food pre-surgery diet
   B. filter food preoperative diet
   C. pre-surgical diet liquid oral liquid food
   D. usual pre-surgical diet

D. Diet in Pregnancy Complication

a. Hyperemesis Gravidarum Diet

Hyperemesis gravidarum is excessive nausea and vomiting, vomiting occurs until 20 weeks of gestation, everything is eaten and drunk will be vomit so that it affects the general condition and daily activities, weight loss and dehydration. Another definition of Hyperemesis Gravidarum is a condition in which a pregnant woman vomits everything she eats and drinks so that her weight is became very low, less skin turgor, less diuresis is less and presence of acetone in urine.

The cause of hyperemesis gravidarum is not known with certainty. but there are several predisposing factors that are thought to be related(Kim *et al.*, 2021), namely adaptation factors, hormonal during pregnancy, Psychological Factors and Allergic Factors. according to the severity of the symptoms Hyperemesis Gravidarum can be divided into 3 levels, namely: Level I (Mild), Level II (moderate), and 3. Level III (severe). The principle of prevention is to change emesis so that it does not become hyperemesis are with:

a) An explanation that pregnancy and childbirth are psychological processes.
b) Eat few but often, like snack biscuits, dry bread with hot tea when mother wake up in the morning and before going to bed. Avoid oily food and smells, food is best served warm.
c) Do not directly stand up when wake up in the morning, or mother will feel dizzy, nausea and vomiting, defecation should be attempted last.

There are several managements of patients with hyperemia, namely isolation, psychological therapy, Adequate parenteral diet

and fluids, and medications to reduce symptoms. Dietary features hyperemesis is on the emphasis on giving food sources of complex carbohydrates, especially in the morning and avoid fatty and fried foods to suppress nausea and vomiting. food and drink should be kept apart to avoid nausea and vomiting.

The purposes of the hyperemic diet are

2) Replacing the body's glycogen supply and control acidosis, and
3) Gradually provide energy and sufficient nutrition.

Hyperemic diet requirements. The conditions for a hyperemetic diet are;

1) high carbohydrates, i.e., 75%-85% of total energy needs,
2) Low fat, i.e., less than or equal with 10 percent of total energy needs,
3) Moderate protein, about 10%-15% of total energy requirements,
4) Food is given in dry form, giving fluids adjusted to the patient's condition, about 7-10 glasses per day,
5) Easily digestible food, does not stimulate the digestive tract, and is given frequently in small portions,
6) When you eat breakfast and afternoons are difficult to accept, optimized for dinner and evening distractions,
7) Food in a variety of ways gradually increased in portion and nutritional value in accordance with the circumstances and patient nutritional needs.

Types of diet and indications.

There are three kinds of hyperemesis diet, which are diet hyperemesis I, II, and III.

1. The Hyperemesis Diet I

The hyperemesis diet I is given to patients with severe hyperemesis. Food only consisting of dry bread, roasted or boiled cassava, and fruit. Water not given alongside with food but 1-2

hours afterward. All the nutrients in food this is lacking except for vitamin C, so it is only given for a few days.

2. Hyperemetic Diet II

The hyperemesis diet II is given when the feeling of nausea and vomiting has been reduced, gradually began to be given with food of high nutritional value, still drinks not given with food. Selection of the right ingredients at the stage can meet nutritional needs, except for energy needs.

3. Hyperemesis Diet III

Hyperemesis diet III is given to patients with mild hyperemesis. In accordance with the patient's ability, drink may be given with food. This food Have enough energy and all nutrients.

The recommended foods for hyperemesis mothers are as follows; Bread, baked goods, biscuits, crackers, fresh fruit, fruit juices, soft drinks (Coca-Cola, Fanta, lemonade), syrup, non-fat broth, tea and weak coffee. While food which not recommended for diet Hyperemesis I, II, and III are foods that stimulate digestive tract like spicy food, foodstuffs containing alcohol, coffee and food contains additives (preservatives, coloring agents, and flavoring agents).

b. Pre-Eclampsia Diet

Pre-eclampsia is the onset of hypertension accompanied by proteinuria and consequent pregnancy edema after 20 weeks of gestation or immediately after delivery. Eclampsia is pre-eclampsia accompanied by seizures and/or coma that arise not as a result of neurology abnormalities. Pre-eclampsia is classified into mild pre-eclampsia and heavy pre-eclampsia. Pre-eclampsia and eclampsia are ongoing complications of pregnancy with the same cause. Therefore, prevention or early diagnosis can be reduced morbidity and mortality. To prevent the incidence of mild pre-eclampsia can be given advice about related diet, enough rest and antenatal supervision (pregnancy). Pre-eclampsia is a syndrome that occurs

when pregnancy enters 20th week with signs and symptoms such as hypertension, perineuria, rapid weight gain (due to edema), rash, nausea, vomiting, dizziness, stomach pain, oliguria, restlessness, and decreased awareness, the characteristic of this diet is to pay attention to salt and protein intake.

The purpose of the pre-eclampsia dietary to;

1) Achieve and maintain status optimal nutrition,
2) Achieve and maintain normal blood pressure,
3) Prevent or reduce salt or water retention,
4) achieve nitrogen balance,
5) maintain normal weight gain
6) Reducing or preventing other risk factors or new complications during pregnancy or after delivery.

The pre-eclampsia diet requirements are;

1) Enough energy and all nutrients. In severe conditions, food is given gradually, according to the patient's ability to receive food. The addition of energy is not more than 300 kcal from food or diet before pregnancy,
2) low salt is given according to the severity of salt retention or water. Try to gain weight below 3 kg/month or below 1kg/week,
3) High protein (1.5-2g/kg body weight),
4) Moderate fat, some fat in the form of monounsaturated fat and polyunsaturated fat,
5) sufficient vitamins; vitamin C and B6 is given slightly higher
6) Adequate minerals, especially calcium and potassium,
7) The form of food is adjusted to the patient's ability to eat,
8) Liquids are given 2500 ml day. In oliguria condition, fluid is limited and adapted to the fluid that comes out through urine, vomit, sweat and inhalation.

Types of diets and indication:

1. Pre-eclampsia Diet I.
   The Preeclampsia Diet I is given to patients with severe pre-eclampsia. Food given in liquid form, consisting of milk and fruit juice, the amount of liquid given at least 1500 ml daily orally, and the deficiency is given parenteral intravenously. This food lacks energy and nutrients, because it is only given during 1-2 days.
2. Pre-eclampsia Diet II.
   The Pre-eclampsia II diet is given as a food transfer from the pre-eclampsia I diet or to patients with pre-eclampsia whose disease is not so severe. Food filtered or soft form and given as a low-salt diet I. This food has sufficient energy and other nutrients.
3. Pre-eclampsia Diet III
   The Pre-eclampsia III diet is given as a food transfer from pre-eclampsia II or to patients with mild pre-eclampsia. These foods contain protein high and low salt, given in soft or regular form. This food has sufficient nutrients. the amount of energy must be adjusted to the increase in body weight may be more than 1 kg per month.

Exercises

1) Explain the purpose of the pre-eclampsia diet
2) What are the eclampsia diet requirements?

Summary

The purposes of the hyperemic diet are to replace the body's glycogen supply and control acidosis, and gradually provide energy and sufficient nutrition. The hyperemesis I diet is given to patients with severe hyperemesis. Diet Hyperemesis II is given when the feeling of nausea and vomiting has decreased, gradually starting to be given with food that has high nutritional value, drinks are still not given with food. Hyperemesis III diet is given to patients with mild

hyperemesis. According to the patient's ability, drink may be given with food. The purposes of the pre-eclampsia diet are to;

1) Achieve and maintain status optimal nutrition,
2) Achieve and maintain normal blood pressure,
3) Prevent or reduce salt or water retention,
4) achieve nitrogen balance,
5) maintain normal weight
6) Reducing or preventing its occurrence other risk factors or new complications during pregnancy or after delivery.

The Preeclampsia I diet is given to patients with severe pre-eclampsia(Perry, Stephanou and Rayman, 2022). Preeclampsia Diet II given as a transfer food from the pre-eclampsia I diet or to preeclamptic patients whose disease is not so severe. The Pre-eclampsia III diet is given as food transfer from pre-eclampsia II or to patients with mild preeclampsia.

Test 5

Instructions for doing questions:
Choose the most correct answer

1) A condition in early pregnancy characterized by nausea and Excessive vomiting for a relatively long time is commonly known as hyperemesis to overcome this it is necessary to do a diet whose emphasis is
   A. Feeding complex carbohydrates
   B. protein food
   C. Reducing the provision of fatty and fried foods
   D. Simple carbohydrate diet
2) The purpose of the diet in early pregnancy with Hyperemesis is to
   A. to replace glycogen stores
   B. provide enough energy and nutrients
   C. control acidosis
   D. replace the supply of protein

3) What are the requirements for the hyperemesis diet?
   A. high carbohydrates, namely 75-80%, high fat, namely > 10%, and high protein, ie > 15% of the total energy needs
   B. high carbohydrates, namely 75-80%, low fat, namely <10%, and moderate protein, ie 10-15% of the total energy needs
   C. high carbohydrates, namely 75-80%, high fat, namely > 10%, and high protein, i.e., > 15% of the total energy requirement
   D. high carbohydrates, namely 75-80%, low fat, namely <10%, and moderate protein, i.e., 10-15% of the total energy needs
4) What is the diet given to patients with severe hyperemia?
   A. hyperemic diet i
   B. hyperemic diet ii
   C. hyperemic diet iii
   D. hyperemic diet iv
5) What nutrients should be limited in patients with pre-eclampsia?
   A. carbohydrates
   B. protein
   C. vitamins
   D. salt

CHAPTER FOUR
NUTRITION NEEDS IN VARIOUS AGE GROUPS

Overview

Every human being will go through stages or cycles in a period his life. This human life cycle consists of periods of pregnancy, lactation, period, infancy, childhood, adolescence, adult and elderly. Every period in we need nutrients to live. Every nutrient requirement stages of life will always be different. In order to carry out its functions optimally and properly supporting life in each period, nutrients must be consumed according to the needs at each stage. If the nutritional needs are not fulfilled, it can lead to various diseases and affect optimal growth and development of each life cycle. One welfare problem in Indonesia which is currently exist is a high number of infant and maternal mortality. The direct cause of these deaths are due to the high rate of infectious diseases. Infectious disease in this risk group is because their body's resistance to fight infection is very low, due to malnutrition. Therefore, it is not surprising that many emerging various infectious diseases are also accompanied by the emergence malnutrition. there is a close reciprocal relationship between infection and malnutrition. Malnourished children are more susceptible to infection because his immune system is weak. On the other hand, children who get infected tend to be more susceptible to malnutrition. Community nutrition improvement is more focused on improving the nutrition of infants and toddlers which is one of the indicators in improvement of public health status.

Another health problem we faced is the increasing number of adult deaths due to heart disease and hypertension. Both are closely related to vascular disease. Meanwhile the others, obesity, and diabetes mellitus, these diseases are associated with unhealthy lifestyle, especially about bad eating habits, lack of exercise smoking habits, and alcohol consumption. To prevent those

diseases, educators can educate society with healthy living behavior education, especially by understanding and practicing balanced nutrition guidelines in daily life. This chapter will help you understand nutritional needs at different age levels. Nutritional needs at various age levels which will be explained in this chapter includes the nutritional needs during pregnancy and breastfeeding, nutritional needs of infants and children, nutritional needs of adolescents and adults as well as nutritional needs of the elderly.

In general, after studying this chapter you are expected to be able to explain nutritional needs of pregnant and breastfeeding women, nutritional needs of infants and children, and nutritional needs of adolescents, adults, and the elderly.

In particular, you are expected to be able to explain:

1. explain the nutritional needs of pregnant women;
2. factors affecting nutritional status of pregnant women;
3. the need for nutrients during breastfeeding;
4. the relationship between mother's nutrition and breast milk;
5. nutritional needs of infants;
6. children's nutritional needs;
7. factors affecting child nutrition;
8. nutritional needs of adolescents;
9. nutritional problems in adolescents;
10. nutritional needs in adult;
11. nutritional problems that occur in adult;
12. factors that affect the nutrition of the elderly;
13. nutritional needs of the elderly;
14. nutritional problems that often occur in the elderly.

Pregnancy and breastfeeding is one of the periods in the human life cycle experienced only by a woman. This period will greatly determine the quality of baby to be born. Babies carried by mothers during pregnancy and babies who are breastfed during the breastfeeding process is determined by the food or nutrients eaten or consumed by the mother during pregnancy and breastfeeding.

A. Nutritional Needs for Pregnant Woman

The beginning of every human life starts from the womb, called pregnancy. Let's review about this. Normal pregnancy lasts 38-40 weeks. If calculated by the size of the day, pregnancy will end after 266 days or 38 postovulatory weeks, approximately 40 weeks from the end of the first day of the last menstrual period. A woman can be confirmed to be pregnant if she shows signs of pregnancy, which are: no menstruation (2-4 weeks after conception); fetal heartbeat; can be seen from ultrasound (ultrasound); shape of the fetus can be felt; and HCG (human chorionic gonadotropins) hormone test in the urine. As an endocrine organ, the placenta produces variety of hormone which are very important for the process of pregnancy. These hormones include: Estrogen, Progesterone, and HCG (human chorionic gonadotropin). Increased production of estrogen effect on the enlargement of the uterus, mammary glands, genital organs; fluid retention causes an increase in sodium; changes in fat disposition and clotting factors in blood; joint relaxation; decreased production of HCl (hydrochloric acid) and pepsin in the stomach. Progesterone stimulates the growth of the endometrium, fat deposition, increased sodium retention and relaxation of muscle tissue (resulting in decreased uterine flexibility, gastric motion and muscle tone).

Endocrine also changes. Pituitary and thyroid glands enlarge slightly, metabolic rate Basal increases (due to increased oxygen consumption and maternal body surface area). babies) as much as 25%. Besides that, the parathyroid glands are also enlarged, it causes an increase in the need for vitamin D and calcium. After second trimester Physiological changes in pregnancy are increasing plasma volume by 40-50%. anemia in pregnancy even though the number of RBC (red blood cell) or red blood cells increase by 33%, plasma protein levels will drop, the kidneys will enlarge to compensate harder work. Growth and development that occurs in both mother and fetus causes oxygen consumption increase, so the impact on cardiac output increases enlarged heart to 12%. Peripheral vasodilation occurs which causes Diastolic pressure

decreases, triggering edema, BMR (basal metabolism rate) will increase by 15-20%.

In the digestive tract, early in pregnancy hormonal changes cause nausea and vomiting so that the appetite will decrease then gradually appetite will increase, intestinal absorption also increases, peristalsis decrease so frequent constipation problems arise. In every day, pregnant women are encouraged to have more nutrients than normal. Additional energy for pregnant women on trimester (TM) II needed for; Expansion of maternal tissue, which are the addition of blood volume, uterine and breast growth and fat deposit. Throughout the third trimester, Additional energy is used for the growth of the fetus and placenta. Nutrition matters on the health and immune system of pregnant women, both before and during pregnancy, as for babies; nutritional status of fetuses born from mothers with malnutrition before pregnancy or during the first week of pregnancy are more likely to suffer brain damage and bone marrow because the central nervous system is very sensitive in the first 2-5 weeks of pregnancy. Malnutrition mother throughout the last week of pregnancy will give birth to a baby with low birth weight. Factors that affect the nutritional status of the mother during conception consist of: social conditions, mother's health and nutrition condition; birth spacing if which conceived not the first child; parity; and age of first pregnancy. While nutritional status the mother during childbirth is influenced by: the social and economic conditions of the mother during pregnancy; degree of physical work; food intake; and infectious disease.

Nutritional status of the mother during pregnancy and childbirth will affect the nutrition of her child. Food for pregnant women should be adjusted to the complaints they are experiencing, such as in the Trimester I; decreased appetite, nausea and vomiting should be given dry food and high in carbohydrates, as well as fruit, then in the second trimester; calorie needs starts to increase (Crozier *et al.*, 2017), body weight starts to increase, at this time it should be given balanced diet, lots of fruit and vegetables, while in

Trimester III the appetite is good so food is given small portions but often, lots of fruit and vegetables.

Lots of things to consider when preparing a balanced menu for pregnant women are: pay attention to the need for energy and nutrients, especially protein, Fe, vitamin C, calcium; selection of food ingredients and their processing according to the mother's complaints; form and the frequency of eating is adjusted according to the mother's complaints. Factors influencing results pregnancy includes the mother's nutritional intake; pre-pregnancy nutritional status; weight gain body during pregnancy; condition of the mother in adolescence (still in the process of growth); number of fetuses per pregnancy; malnutrition during pre-pregnancy and inadequate intake during pregnancy are at risk of abortion, stillbirth, and low birth weight babies (LBW); Obesity causes difficulties to get pregnant, the risk of hypertension during pregnancy and is at risk gestational diabetes (diabetes triggered by pregnancy).

Additional energy needed by pregnant women with good nutritional status during pre-pregnancy, also physical activity for the first trimester, almost no additional energy needed. The second trimester requires 300-350 kcal/day, and the third trimester requires additional energy of 450-500 kcal/day.

1. Calorie Needs

   Pregnant women need additional energy/calories for growth and fetus development, placenta, breast tissue, fat reserves, and for changes in metabolism that happened. In the second and third trimesters, this additional calorie requirement is around 300 calories per days compared to non-pregnant. Based on calculations, at the end of pregnancy it is needed about 80,000 calories more than your pre-pregnancy calorie needs.

   Carbohydrate is a major source of additional calories needed during pregnancy. The growth and development of the fetus while in the womb requires carbohydrates as main source of calories. The recommended choice is complex carbohydrates such as bread, cereals, rice and pasta.

Besides containing vitamins and minerals, complex carbohydrates as well increase the recommended fiber intake during pregnancy to prevent constipation or difficult bowel movements and hemorrhoids.

2. Protein Needs
   The protein requirement for pregnant women is around 60 grams per day. That is, pregnant women need 10-15 grams protein higher than the needs of women who are not pregnant. Proteins needed to form new tissue, as well as the placenta and fetus. Proteins It is also needed to support cell growth and differentiation.
3. Lipids/Fat
   Fat is a vital source of energy and for placenta tissue growth. In a normal pregnancy, the level of fat in the bloodstream will increase in end of third trimester. The body of a pregnant woman also stores fat which will support her preparation for breastfeeding after the baby is born.
4. Vitamin and Mineral Needs
   The need increases compared to before pregnancy, to support growth and fetus development and the process of cell differentiation. Additional important nutrients are also needed to helps the process of energy metabolism such as vitamins (Vit) B1, vitamin B2, niacin, and acids. Pantothenic acid, Vit B6 and B12 are needed to form DNA (Deoxyribonucleic Acid) and red blood cells, while Vit B6 also plays an important role in amino acid metabolism.

The need for vitamins A and C also increases during pregnancy. Likewise, mineral needs especially Mg (magnesium) and Fe (iron). Mg is needed for support growth of soft tissue. Meanwhile, Fe is needed to form red blood cells red and is essential for growth and energy metabolism, as well as for Minimizes the chance of anemia. The need for iron is doubled
compared to before pregnancy.

Compared with the needs of normal pregnant women, energy and protein needs will further increase in teenage pregnant women, pregnant women with pre-pregnancy weight less and working pregnant women. For pregnant women where the pre-pregnancy weight including obesity, the energy requirement becomes less, but protein needs remains the same as a normal pregnancy. Problems related to pregnant women related to nutrients are the presence of nausea and vomiting, especially in the early days of pregnancy, how to deal with it can be given food in small portions but often, avoid stimulating odors, drink small amounts after meals, drink moderately in between mealtimes, have breakfast with easily digestible foods such as flour and sugar.

The next problem is the rise of gastric fluids (heart burn). To overcome it mother should not lying down after mealtimes, if they want lying down the head should be elevated, and avoid foods that can stimulate gastric fluid. Next is constipation, to avoid it mother should provide lots of fibrous foods such as vegetables and fruit, drink quite a lot and do light physical exercise.

B. Nutritional Needs for Breastfeeding Woman

The production of the Estrogen and Progesterone hormones during adolescence causes the milk glands and ducts are formed, so that a woman's breasts enlarge. When pregnant, the mother produces prolactin hormone and the placenta produces the lactogen hormone, while the production of estrogen and progesterone also increases. mother consumption during breastfeeding will affect the nutrition of breast milk. Mother's food can affect nutrition in infants through breastfeeding.

Avoid spicy foods as well as caffeine because they can stimulate bloating, diarrhea, allergies or other problems to the babies. Hot and spicy food can cause digestive disorders; mother's caffeine consumption not only keeps them awake but also makes it difficult for the baby to sleep so that the rest time is reduced even though they need rest to come back taking care of the baby the next

day; Dairy products, onions, cabbage might cause bloating and colic.

Nutritional needs of breastfeeding mothers include energy needs, to produce mother's milk, breastfeeding mothers need additional energy sourced from 1) food 330 kcal in the first six months and 400 kcal in the second six months. 2) 100-150 Kcal from the mother's own body fat reserves. Because body fat is used, the mother's weight post-partum decreased 0.5 to 1 kg/month. Protein Requirements: Additional protein the first and second six months of 25 g/day. Fat intake is 25-30% intake energy, Carbohydrate intake is approximately 160-200 g/day. Breastfeeding mother needs more vitamins greater than pregnant women except for vitamins D and K. Breastfeeding mothers who are deficient vitamins cause vitamin ASI is also reduced. The mineral needs of nursing mothers are larger compared to pregnant women except: Ca, P, Mg, F and Mo. As long as not experiencing menstruation after giving birth, mothers need less Fe than mothers who's not pregnant.

The need for water in breastfeeding mothers increases as much as milk production (so it's better mothers drink 1 cup per feeding). Breastfeeding mothers should not drink coffee because coffee can mix with breast milk which causes babies to have sleeping problem(Aimee *et al.*, 2018). Things must be avoided by breastfeeding mothers include: smoking; drinking coffee; drugs; and radiation.

Exercise

To deepen your understanding of the material above, do some exercises
following!

1) Describe the three physical changes that occur in pregnant women that affect nutritional needs!
2) What is the total amount of weight gain recommended during pregnancy in normal pregnant women with good nutrition?

3) Mention two minerals most needed by mothers during pregnancy and breastfeeding!
4) Name four types of food that should be avoided by breastfeeding mothers!

Summary

Additional energy for pregnant women in the second trimester is needed for; fetal growth and placenta. Factors that influence the nutritional status of the mother during conception: the social and economic condition of the mother before pregnancy; mother's health and nutritional status; birth spacing if the conceived is not the first child; parity; and gestational age.

The nutritional status of the mother at the time of delivery is influenced by social and economic conditions mother during pregnancy, degree of physical work, food intake, and whether or not she was infected

infectious disease. Things to consider when preparing a balanced menu for pregnant women is to pay attention to the needs of energy and nutrients, especially protein, Fe, vitamin C, and calcium.

There are several factors that affect pregnancy outcomes including Mother's nutrient intake mother's; pre-pregnancy nutritional status; weight gain during pregnancy; adolescents mother's condition; number of fetuses per pregnancy. Malnutrition during pre-pregnancy and lack of intake during pregnancy; risks abortion, stillbirth, and low birth weight (LBW) babies. Obesity causes difficulty getting pregnant, risk hypertension during pregnancy and at risk for gestational diabetes (diabetes precipitated by presence of pregnancy).

Test

Choose the most correct answer

1) The occurrence of an increase in the hormone estrogen will affect.
   A. Decreased Sodium
   B. Increased production of HCL
   C. Increased pepsin in the stomach
   D. Folic acid metabolism
2) How much is the recommendation for weight gain during pregnancy for normal weight before normal pregnancy?
   A. 9.5-10 Kg
   B. 10-12.5 Kg
   C. 11.5 – 16 Kg
   D. 15-16 kg
3) How much energy should be added per day during pregnancy?
   A. 300 kcal
   B. 400 kcal
   C. 500 kcal
   D. 600 kcal
4) How much calcium does a 17 year old pregnant woman need?
   A. 1000 mg
   B. 1100 mg
   C. 1200 mg
   D. 1300 mg
5) How much additional protein is needed in the first and second six months in nursing mothers?
   A. 10 g/day
   B. 15 g/day
   C. 25 g/day
   D. 30 g/day

C. Nutritional Needs for Infant

Additional food as complementary food to breast milk must be adjusted depending on the age of the baby, the alternatives for fulfilling baby nutrition are adjusted according to baby age.

a. Baby Nutrition Age 0 – 6 months.

In infants aged 0-6 months, the most appropriate food for babies is breast milk, because the composition of the nutrients in breast milk is the most appropriate for babies this age. Exclusive breastfeeding according to the World Health Organization (WHO), (2016) is breast milk feeding only without additional liquids, either formula milk, water, orange juice, or another food addition. Before reaching the age of 6 months, the baby's digestive system is not yet capable functioning perfectly, so its not been able to digest food other than breast milk.

The recommendation for exclusive breastfeeding for 6 months was also issued by The American Dietetic Association in October 2001 simultaneously with the publication of a guide entitled " Exclusive Breastfeeding for 6 months and Breastfeeding with Complementary Foods for at Least 12 months is the ideal feeding pattern for infants "Mothers who work and feel difficulty giving breast milk to the baby, can pump milk before go to work and then give it to the baby using a spoon.

At the age of 4-6 months the baby's weight will be double the weight at birth. So, baby will need more food. Usually until the age of 6 months milk can still meet the baby's nutritional needs. If at the age of the first month of milk production reaching about 500 milliliters per day, entering the second and third months of milk production can go up to about 650 milliliters per day. If every 100 ml of breast milk gives 75 calories, meaning that from breast milk the baby will only get 450 calories, while the amount needed is about 750 calories, so it's still 300 calories short, and this deficiency can be fulfilled from other additional food.

The principle of feeding at this age is that breast milk is a must be given food, give breast milk first, after that complementary food; start introduce a variety of foodstuffs; give food according to

the number of caloric needs to prevent obesity/malnutrition. Types of complementary foods that can be given to babies over 6 months of age are semi-solid foods(WHO, 2009) which can be in the form of: a) mashed fruit or fruit juice such as bananas, papaya, orange, and tomato, b) rice flour porridge or mixed porridge from rice.

b. Baby Nutrition Age 9-12 months.

A 9-month-old baby is the second transitional age in baby food management. Babies food that previously relied on breast milk as the main nutrient provider, after 9 months babies will switch to weaning food as the main nutrient provider, while breast milk only acts as a complement. At the age of 9 months the baby's caloric needs are 350 cal (from 500 ml of breast milk). So that additional food is needed by 450-500 calories per day. The problem in preparing additional food for babies at this age is how to arrange the food so that it meets the baby's need for nutrients, with quality close to the nutritional quality of breast milk.

If in that area it is difficult to obtain food sources of animal protein, either due to the limited types of food available or because the price is not affordable, the most recommended solution is to combine staple foods (rice, corn, tubers, or sago) with legumes or produce processed products (tempeh, tofu) and if possible, supplemented with food sourced from animal protein. Food consists of a mixture of: staple food sources of calories, food sources of vegetable protein, called nuts or their processed products (tofu, tempeh) and food sources of animal protein as additives, as well as green vegetables as a source of minerals and vitamins.

D. Nutritional Needs for Children

Nutrition is an important factor in growth and development of toddlers. Growth (growth) related to the problem of changes in size, amount, size or dimensions the level of cells, organs and individuals that can be measured and have an impact on the physical aspect. While the development is increasing the ability (skill) in more

complex structures and functions of the body in regular and predictable patterns predicted, as a result of the ripening process.

Several experts express different concepts about the factors that influence a person's growth and development. From these differences it can be drawn similarities about the factors that influence a person's growth and development, namely biology (genetics), behavior and the environment. The basic needs of children to grow and develop are generally divided into 3 basic needs, namely: 1) **Biomedical physical needs**, including: Food/nutrition which is the most important need; Basic health care includes immunization, breastfeeding, weighing babies/children regularly; Eligible boards/settlements; Personal hygiene, environmental sanitation; Physical fitness, recreation. 2) **Emotional/affection needs** consist of: a close, intimate and harmonious relationship between the mother and child is an absolute requirement to guarantee harmonious growth and development both physically, mentally and psychosocially. This is manifested by physical and psychic contact as early as possible. Affection from parents will create a close bond (bonding) and basic trust (basic trust), 3) **Stimulation Needs**: Stimulation is the forerunner in the learning process (education and training) in children. This mental stimulation promotes development mental psychosocial: intelligence, skills, independence, creativity, religion, personality, moral ethics, productivity. Factors influencing nutritional status, Malnutrition in toddlers is the cumulative impact of various factors both directly influencing or indirectly on child nutrition.

The foodstuffs that should be avoided at the age of 1-5 years are foods that are heavy oily, junk food, and food with preservatives. Use fresh ingredients for the family meal menu especially for toddlers. Use salt if necessary, should be used in small quantities and choose Iodine salt which is good for health. When buying packaged food, pay attention for other substances and the date of use.

Exercise

To deepen your understanding of the material above, do some following exercises!

1) What is the most appropriate food for babies under six months?
2) When should the baby be given complementary food?
3) Explain the factors that affect the nutritional status of children!

Summary

Nutrients are needed in infants and children, especially for growth and brain development. Breast milk is the best food for baby. Giving Supplementary food as complementary food for breast milk must be adjusted to the age of the baby. At the age of 0-6 months, the most appropriate food for babies is breast milk. A 9-month-old baby is the second transitional age in baby food management. nutrition is an important factor in the pattern of growth and development of toddlers. Basic needs of children for growth and development, in general divided into 3 basic needs, namely: 1) Biomedical physical needs, 2) Emotional/love needs, 3) Stimulation Needs.

Test

Instructions for doing the questions.

Choose A if answer no: 1, 2 and 3 is correct
Choose B if answers no: 1 and 3 are correct
Choose C if answers no: 2 and 4 are correct
Choose D if only answer no: 4 is correct
Choose E if all the answers are correct

1) According to some experts, brain growth is strongly supported by fulfillment nutritional needs. Therefore, the child's brain tissue that grows normally before age 3 years will reach what percentage of the weight of the adult brain?
   1. 70 %
   2. 75 %
   3. 80 %
   4. 85 %

2) Which of the following patterns of feeding at the age of 0-12 months is correct?
   1. Breast milk, juice, fruit, soft food
   2. Breast milk, fruit juice, fruit, soft food
   3. Breast milk, fruit, soft food, solid food
   4. Breast milk, complementary food, fruit juice, soft food
3) What is the best food for babies aged 0-6 months?
   1. Formula milk
   2. Mother's milk
   3. Liquid food
   4. Fruit juice
4) At what age should babies start giving complementary foods?
   1. 3 months
   2. 4 Months
   3. 5 Months
   4. 6 Months
5) The purpose and importance of supplementary feeding are:
   1. Complementing the nutrients that are lacking in breast milk
   2. Developing the baby's ability to accept various flavors of food
   3. Develop baby's ability to chew
   4. Make adaptations to foods high in vitamins

E. Nutritional Needs for Adolescent

Adolescent is the age of 10-19 year. In this phase it is a transitional period meaning that it is no longer children but also not yet in the adult category. Teenagers make up 20% of the world's population and 80% of the population in developing countries, is a period of much turmoil and is a time critical in physical, psychological, and behavioral growth.

Physical changes in adolescents can be seen in the peak changes in height. The increase in height can be up to 8-15 cm in a few months and is individual. another change is in rapid weight gain, muscle mass increases, followed by strength, maturation of bone mass, increase in size of internal organs, hormonal changes

such as acne, body odor and changes in voice and changes in tooth composition. Puberty also occurs in this phase, namely the occurrence changes in body shape, development of the reproductive system, sex hormones that will influence behavior and emotions. This puberty process will last 3 to 7 years. In girls, the earliest it occurs at the age of 6-7 years and the latest at the age of 13 years marked by menarche or first menstruation, and related to growth breast. In boys, the earliest occurs at the age of 8 years, and at the latest age 13.5 years, so boys can mature quickly or vice versa. While change Psychologically characterized by the onset of thinking maturity, emotional and intellectual, and cognitive and emotional development.

The Adolescent Period is divided into 3 stages, namely:

1. Early Adolescence: start rapid growth; start thinking about body image; start following idols; same sex and age.
2. Teenagers (14-16 years): peak growth, acne, body odor; started happening cognitive and moral development; refuse the family diet, because of prestige; and more concerned with appearance.
3. Late Adolescence: growth slows down; start holding certain values; cognitive and morals: idealistic, consistent with one's values and beliefs; and everything.

F. Nutritional Needs for Adult

Caloric needs begin to decrease at the age of 25, depending on physical activity, gender, and body mass. Iron is needed by the childbearing age during the period reproduction, to replace iron losses during menstruation, pregnancy, birth and breastfeeding, calcium also plays an important role for bones, loss of calcium in bone mass decreases with advancing age. Drinking habits Milk or eating food sources of calcium is recommended for adults. Good food management: eat low-fat foods, eat low cholesterol; eat more fiber: fruit, vegetables, and nuts; eat more complex carbohydrates: whole grains, legumes, and vegetables; avoid alcohol; read labels food, and reduce consumption of sugar. Nutritional problems in

adulthood include: Less Protein Energy (KKP), Anemia in women and over nutrition/obesity problems. This more nutrition due to the tendency of people to choose foods that are high in calories and fat but low in fiber mainly due to increasing economic status, lifestyle/activity also causes the accumulation of body fat which leads to obesity.

Along with increasing age, the speed of the body's metabolism also begins decreases starting at the age of 30 years, if physical activity is also reduced then fat deposits cause obesity. Other factors that also play a role in obesity are: genetics; age; pregnancy; behavior and environment. Some important principles in prevention disease: 1) sport and physical activity: Physical activity needs to be integrated into activities everyday (use the stairs instead of the lift/elevator); Sports activities should be started from childhood and youth to form lifelong habits; Adults need to be encouraged to increase the habit of daily physical activity, at least 30 minutes of moderate intensity exercise every day; Women should be given the opportunity to engage in a variety of interesting, regular and consistent exercise.

The benefits of exercises are to strengthens the heart and increases its efficiency; increases the vascular power of the heart muscle; helps maintain normal blood pressure; Increasing High-density lipoproteins (HDL/good cholesterol) and lowering total cholesterol levels; increase muscle strength and reduce the risk of joint weakness and bones; reduces bone calcium loss, lowers the risk of osteoporosis; affect mood (mood) and power of concentration. Principles of balanced adult nutrition: The human body requires a variety of foods guaranteed to contain a source of carbohydrates (rice, bread, potatoes, noodles, cassava, etc.), animal/vegetable protein (fish, eggs, meat, chicken, tempeh, tofu, nuts), vitamins and minerals (fruits, vegetables), and sources of fat/oil (cooking oil, coconut milk, butter, margarine) and water.

Exercise

To deepen your understanding of the material above, do some following Exercise!

1) Describe the physical changes that occur in adolescents!
2) Describe the most common problem of nutritional deficiency in young women!
3) When does the body's metabolic rate begin to decrease?
4) Explain the types of nutrients that must be reduced in adults!

Summary

Adolescent is the age of 10-19 years; adult age category is divided into two namely young adults between the ages of 18-30 years and old adults aged > 30 years. Malnutrition in adults is Protein Energy Deficiency and anemia, Overnutrition Problems are weight excess and obesity. Caloric needs begin to decrease at the age of 25, depending on physical activity, gender, and body mass. Iron is needed by childbearing age during the reproductive period, to replace losses during menstruation, pregnancy, birth and breastfeeding. Calcium also plays an important role for bones, remember loss of calcium in bone mass decreases with advancing age. Drinking Milk or eating food sources with calcium is sufficiently recommended for adult. Good food arrangements are: low fat food, low food cholesterol, food with more fiber, eat, avoid alcohol, read food labels, use more often food sources with omega 3 and reduce sugar consumption.

Test

Instructions for doing the questions:
Choose the most correct answer
Choose A if answer no: 1, 2 and 3 is correct
Choose B if answers no: 1 and 3 are correct
Choose C if answers no: 2 and 4 are correct
Choose D if only answer no: 4 is correct

1) Protein needs for teenagers….
   1. gr/kgBB/day
   2. gr/kgBB/day
   3. gr/kgBB/day
   4. gr/kgBB/day
2) What causes adolescents to be at a nutritionally vulnerable age?
   1. Lifestyle and habits change
   2. Changes in needs due to physical changes
   3. Pregnancy preparation
   4. Endurance decreases
3) Which of the following are characteristics of early adolescence?
   1. Experience accelerated growth
   2. Start thinking about body image
   3. Start following idols
   4. Sedentary growth
4) What is the problem of malnutrition that often occurs in adolescents?
   1. Sodium deficiency
   2. Deficiency of vitamin a
   3. Energy deficiency
   4. Iron deficiency
5) What are the causes of protein energy deficiency in adulthood?
   1. Poverty
   2. Selection of the wrong food
   3. Stress
   4. Degenerative disease

G. Nutritional Needs for Elderly

According to World Health Organization (WHO), (2016) elderly is divided into middle age (45-59), elderly (60-74), old age (75-90), and very old age (> 90). research result shows that the basal metabolic rate in elderly decreased by about 15-20%, due to

reduced muscle mass and activity. Calories (energy) is obtained from fat 9.4 cal, carbohydrates 4 cal, and protein 4 cal per gram. For the elderly, the composition of energy should be 20-25% from protein, 20% from fat and the rest from carbohydrates. The calories requirement for male elderly is 1960 cal, meanwhile for woman elderly about 1700 cal. If the number of calories consumed is excessive, then some Energy will be stored in the form of fat, so obesity will arise. Conversely, if too little, then the body's energy reserves will be used, so the body will become thin.

- Carbohydrates and Dietary Fiber Requirements
  One of the problems that many elderlies suffer is constipation or and the formation of lumps in the intestine. Dietary fiber has proved to be able to cure these difficulties. A good source of fiber for the elderly is vegetables, fresh fruits and whole grains. Elderly are not recommended to consume fiber supplements (which are sold commercially), because there are concerns about consuming too much fiber a lot, which can cause minerals and other nutrients to be absorbed by fiber so they don't can be absorbed by the body. The elderly is recommended to reduce their consumption of simple sweets and replace them with complex carbohydrates, which come from nuts and seeds which serve as an energy source.
- Protein Requirements
  In general, the protein requirement for adults per day is 1 gram per kg body weight. In the elderly, muscle mass is reduced. But it turns out that the body's need for protein does not decrease, it must even be higher than adults, because in the elderly the efficiency of using nitrogen compounds (proteins) by the body has decreased (due to less efficient digestion and absorption). Several studies recommend that for the elderly, protein consumption should be increased by 12-14% of the portion for adults. Good sources of protein include animal-based foods and nuts.

- Fat Requirements
  The recommended fat consumption is 30% or less of total calories needed. If consumption of total fat that is too high (more than 40% of energy consumption) it can cause atherosclerosis (blockage of blood vessels to the heart). It is also recommended that 20% of the fat consumption is unsaturated fatty acids (PUFA = polyunsaturated fatty acids). Vegetable oil is a source of unsaturated fatty acids.
- Vitamin dan Mineral Needs
  According to the study's findings, elderly typically don't get enough vitamin A, B1, B2, B6, niacin, folic acid, and vitamins C, D, and E. In general, this insufficiency is mostly brought on by restricted dietary intake, particularly of fruits and vegetables, as well as diminished physical capacity. Calcium deficiency, which results in brittle bones, and iron deficiency, which results in anemia, are the two most prevalent mineral deficiencies in elderly people. The elderly has a greater requirement for vitamins and minerals since they aid in the metabolism of other nutrients. Fruit and vegetables are good sources of fiber, vitamins, and minerals and should be consumed frequently.

The elderly has issues with decreasing gastric acid output and food digestion enzymes, which interferes with vitamin and mineral absorption and causes micronutrient deficiencies. Elderly people experience discomfort as their bowel mobility declines and they have trouble urinating. Anemia can result from bleeding from hemorrhoids. By often taking drugs or alcohol, one may lose appetite, which can result in malnutrition as well as hepatitis or liver cancer. faulty motor skills, which result the elderly struggle to prepare their own food. Lack of social interaction and loneliness (which might cause psychological changes) lead to a decreased appetite and subsequent malnutrition. Malnutrition results from a decline in food consumption and a decline in income (retirement).

Senility, or dementia, causes frequent eating or even forgetting to eat, which can result in obesity.

Exercise

To deepen your understanding of the material above, do some following exercises

1) Describe the physical changes that occur in the elderly!
2) Explain the composition of the recommended energy sources for the elderly!
3) Why does the elderly generally consume less vitamins?
4) Explain the impact of excessive fat consumption on the elderly!

Summary

Young elderly (aged 65 to 75) and senior elderly are two categories of the elderly (75 years). Age-related physical, psychological, and social changes have an impact on how well-nourished the elderly are. The esophagus is dilated, the sensation of hunger diminishes, Science of nutrition 75 peristaltic motions are ineffective, and food absorption in the intestines decreases. psychological factors including depression, the death of a relationship, or living alone. The majority of older adults have overweight or obesity.

Because of their decreased muscle mass and activity, elderly have a 15–20% reduction in basal metabolic rate. For the elderly, the ideal energy composition is for 20–25% of the energy to come from protein, 20% from fat, and the remaining 70% from carbohydrates. elderly need 1960 calories per day, whereas elderly women need 1700 calories per day. Constipation, or constipation (difficult bowel motions), and the development of lumps in the colon are two issues that many elderly people have.

Vegetables, fresh fruit, and whole grains with their original bran are excellent sources of fiber for elderly. It is not advised that elderly people take fiber supplements (which are sold commercially). Elderly people are encouraged to consume less

simple sweets and more complex carbs, which can be found in nuts and seeds and act as a source of energy. The portion of protein for adults should be increased by 12–14% for the elderly. Animal products and nuts are both excellent sources of protein. 30 percent or fewer of the total number of calories required should be consumed as fat. Also, it is advised that 20% of the fat consumed be polyunsaturated fatty acids (PUFA), which are not saturated fatty acids.

The elderly typically consumes less food, especially fruits and vegetables, and are generally deficient in vitamins A, B1, B2, B6, niacin, folic acid, and vitamin C, D, and E. These deficiencies are mostly caused by the elderly's reduced food consumption. The most common ailments experienced by the elderly are anemia and fragile bones brought on by iron deficiency. Fruit and vegetables are good sources of fiber, vitamins, and minerals and should be consumed frequently.

Test

1) Factors that affect nutrition in the elderly....
   A. Intestinal peristalsis increases
   B. The esophagus is narrowed
   C. Absorption of food increases
   D. Digestive ability is reduced
2) Recommended energy from fat is:
   A. 10%
   B. 15%
   C. 20%
   D. 30 %
3) Protein consumption in the elderly should be increased by how many percent of the requirement

adults?

   A. 10 – 12%
   B. 12 – 14%
   C. 14 – 16%
   D. 16 – 18%

4) What percentage of fat needs come from unsaturated fats in the elderly?
   A. 5 %
   B. 10%
   C. 15%
   D. 20 %
5) Problems that often arise in the elderly causing malnutrition....
   A. Motor disorders
   B. Lack of socializing
   C. Decreased Income
   D. Diligent worship

CHAPTER FIVE
NURSING NUTRITIONAL STATUS ASSESSMENT

A. Form of Malnutrition

Nutritional status can be influenced by 2 main things i, namely. consumption of food and health status. In nutrition terminology good nutrition status or malnutrition are included in Malnutrition. Malnutrition is a pathological condition due to deficiency or relative or absolute excess of one or more nutrients. There are four forms malnutrition, 1) Under nutrition, which is a relative lack of food consumption

or absolute for a certain period), 2) Specific deficiency, which is lack of nutrients in certain conditions, 3) Over nutrition, which is excess food consumption in a certain period, and 4) Imbalance, which is disproportion of nutrients, for example cholesterol problems occur because imbalance of body lipid fraction. So it is clear that it is clear that malnutrition is not just lack of nutrition**.**

B. Assessment of Nutritional Status

There are two methods of assessing nutritional status:1) Direct nutritional status assessment consisting of Anthropometric, Clinical, Biochemical, Biophysical, 2) Indirect; consists of food Consumption Survey, Vital Statistics, Ecological Factors. since there are many methods of assessing nutritional status, it is necessary to consider factors for choose an assessment method; 1) Purpose, 2) Sample Unit to be measured, 3) Required information, 4) reliability and accuracy, 5) Facilities &existing equipment, 6) Manpower, 7) Time, 8) Available funds.

C. Direct Assessment of Nutritional Status

Growth is a change in size, number, size & function of cells, tissues, organs level individual as measured by length, weight, bone age & balance metabolism, while development is the increasing

ability in the structure & more complex bodily functions in regular & predictable patterns. Growth and development are influenced by internal factors (genetic) & factors external/environmental. Examples of environmental factors that affect the growth and development is the prenatal environment consisting of: Pregnant nutrition, Mechanical, Toxins/substances, chemical, endocrine, radiation, infection, stress, embryo anoxia, while the postnatal environment consists of: Biological, physical, psychosocial, family, customs, beliefs, etc.

1. Anthropometry

Anthropometry is used to see the imbalance of protein and energy intake (carbohydrates and fat). Anthropometry pros: Easy tool, can be done repeatedly & objectively, anyone can be trained to measure, relatively inexpensive, easy results inferred, scientifically validated, simple, safe, large sample size, precise, accurate, can describe past nutritional history, can be used for screening & evaluating nutritional status. cons of anthropometry include: not sensitive & specifically measures a substance nutrition, can be influenced by factors outside of nutrition such as disease, measurement errors can occur.

Anthropometry as an indicator of nutritional status can be done by measuring several parameters. This parameter consists of: 1) Age, children 0-2 years and full years > 2 years calculated from the day of birth, for example a baby aged 6 months 10 days is calculated 6 months old or 8 years 4 months old is counted as 8 years. 2) Weight use appropriate scales and the right way, 3) Height is measured in a straight position with the right way, 4) Upper arm circumference can use LILA tape or tape measure, 5) Head circumference, 6) Chest circumference, and 7) Soft tissue (subcutaneous fat) were measured using a special tool. Parameters as a single measure cannot be used for assess nutritional status should be combined. The combination of several parameters is called an Index Anthropometry consisting of: 1) Weight for age (BB/U), 2) Height according to age (TB/U), 3) Weight according to height (BB/TB), 4) Upper arm circumference according to age

(ALL/U), Body Mass Index (BMI), etc. Lots of sources that can used to classify nutritional status using anthropometric indices but still needed an auxiliary table to find out the normal parameters.

Each anthropometric index has its own advantages and disadvantages, for example Weight/age advantages: Easy, quick to understand, can measure acute & chronic status, sensitive to change, can detect overweight, while the weakness: influenced ascites/edema, must clearly know the date of birth, often wrong in measurement. Height/age advantages: easy tool inexpensive, flexible, can measure past nutrition, while the weaknesses: height changes slowly, the position must be right, the age must be certain,

Weight/Height PROS: no need for age data, can distinguish the proportion of fat, normal, thin bodies CONS: Does not provide an overview of children's height according to age, difficult to do in toddlers, 2 kinds of measuring instruments, longer, measurement errors often occur. Upper arm circumference/age PROS: Good for assessing Severe Protein Energy Deficiency, inexpensive, easy, CONS: Difficult to determine the threshold, difficult to assess the growth of children 2-5 yrs.

2. Clinical Examination

Clinical examination as a direct method of assessing nutritional status, in general, it consists of two parts, 1) medical history/medical history is notes regarding the development of the disease, 2) physical examination, which is conducting physical exam from head to toe for signs and symptoms if there is nutritional problem. We start with the medical history. In this history we record every event related to the symptoms that arise in patients and their factors that affects it. Our records must include the complete identity of the patient, current medical history, past medical history relating to the current illness, family health history, physical and socio-cultural environmental data related to nutrition, additional data needed, for example, food allergies history, type of diet and medication, etc. These data can be collected through interviews with patients and family.

3. Physical Examination

Physical examination can be done through inspection techniques or check views, palpate, percuss or auscultate. All changes in hair, skin, eyes, mouth, tongue, teeth, thyroid gland, etc. According to Jelliffe and Jelliffe, clinical signs can be grouped in three major groups 1) group 1, the signs are indeed true Associated with malnutrition can be due to a deficiency or excess of nutrient 2) group 2, signs that require investigation or further investigation because this sign may be a sign of malnutrition or may be caused by other factors, and 3) signs not related to nutrition although almost similar, to be able to determine it requires special expertise. To classify the signs that exist in patients, the examiner must know signs and symptoms due to deficiency or excess of any nutrient. For example, eye examination: examination of the eye that enters group 1 or related to malnutrition, for example: anemic conjunctiva, keratomalacia, angular palpebritis, while group 2 is possible related to malnutrition, for example: corneal vascularization, conjunctival infection, Corneal arcs, xanthomata, corneal scars. Signs belonging to group 3 are pterygium.

As with other methods of assessing nutritional status, a physical examination is also important. The pros or advantage is that it is relatively cheap, no requires special personnel or enough trained paramedics, simple, fast, and easy interpreted, and simple equipment while the weakness is some symptoms sometimes not easy to detect, sometimes non-specific, multiple clinical symptoms may occur at the onset or later stages of the disease, presence variation in clinical symptoms.

Biochemical examination of nutrients consists of 1) assessment of iron status by check hemoglobin (Hb), hematocrit, serum iron, serum ferritin, transferrin saturation, free erythrocytes protophoprin, serum unsaturated iron-binding capacity, 2) Protein status assessment can be determined by examining the protein fraction, namely albumin, Globulin, and Fibrinogen, 3) assessment of vitamin status depends on the kind of vitamin we want to asses for example vitamin A is assessed by examining serum retinol,

vitamin D is assessed by examination of serum calcium, vitamin E is assessed serum vitamin E, vitamin C can assessed by examination of bleeding and radiological abnormalities. Riboflavin status (B2) assessed by examining the content of riboflavin in urine, niacin assessed by urine nimethyl nicotamine examination. Just like vitamins, minerals for example, iodine is assessed by checking the level of iodine in the blood urine and levels of the hormone TSH (thyroid stimulating hormone), Zink or zinc assessed by examination of urine, or its presence in plasma, Calcium examined by serum calcium examination, as well as other minerals. Biochemical examination results of each substance. The nutritional values are compared with normal values so that if they are below normal value means there is a shortage otherwise if it is above the normal value it could be because excess of certain nutrients.

4. Biophysics

We continue by knowing the method of assessing nutritional status with biophysics. It can be seen from the ability of tissue function and structure changes. Network function capability tests include work and energy capabilities expenditure and attitude adaptation. Structural change test can be seen clinically (e.g., hardening of nails, hair growth, etc.) or non-clinical (e.g., radiology). Biophysical assessment can be carried out in three ways, 1) radiological tests, 2) functional tests physical (e.g., adaptation test in a dark room), and 3) cytology (e.g., in PEM with see stains on the epithelium of the oral mucosa). This biophysical assessment requires a great financial support.

D. Indirect Assessment of Nutritional Status

Indirect Assessment of nutritional status consists of

1. Food consumption survey

   This survey is used to determine the nutritional status of individuals or groups. Food consumption survey is intended to determine eating habits or descriptions level of adequacy of foodstuffs and nutrients at the group, household and community levels individual and the factors that influence it.

Based on the type of data obtained, the measurement of food consumption produces two types of data, namely qualitative (i.e., food frequency, dietary history, telephone method, and food list) and data quantitative (e.g., 24-hour recall method, food estimation, food weighing, food accounts, inventory methods and record).

2. Ecological Factor Assessment
   Malnutrition is an ecological problem as a result of interaction of several physical, biological, and cultural environmental factors. there are six ecological factors related to malnutrition groups, called the state of infection, food consumption, cultural influence, socio-economic, food production, and health and education.
3. Vital Statistic
   One way to get description of the state of nutrition in an area is by analyzing health statistics. By using health statistics, we can see indirect indicators measurement of nutritional status in the community. Some statistics related to the state of health and nutrition, are morbidity and mortality rates death, health services, and infectious diseases related to nutrition.

Exercises

For better understanding of the Topic 3 material, do the exercises
following!

1) Describe the forms of malnutrition
2) Mention the method of assessing nutritional status
3) What is the advantages and disadvantages of the anthropometric method?

Summary

There are four forms of malnutrition which are; Under nutrition, Specific deficiency, over nutrition, Imbalance. There are two methods of assessing nutritional status, which are 1) direct assessment of nutritional status consists of Anthropometric, Clinical,

Biochemical, Biophysical, 2) Indirect assessment consists of Food Consumption Survey, Vital Statistics and Ecological Factors.

Test

Choose the correct answer

1. a form of malnutrition when there is a relative shortage of food consumption or absolute for a certain period is called
   a. under nutrition,
   b. specific deficiency
   c. over nutrition,
   d. imbalance
2. Adult Body Mass Index (BMI) for the Asia Pacific region considered as underweight category is
   a. <18.5 Kg/M2
   b. >18.5 - <23 Kg/M2
   c. 23 - <25 Kg/M2
   d. 25 - <30 kg/m
3. Assessment of nutritional status with anthropometry can be done by assessing
   a. Medical history
   b. Blood test results
   c. Weight
   d. Asking complaint
4. Which of the following is a direct way of assessing nutritional status?
   a. Anthropometric measurements
   b. Ecological assessment
   c. Food consumption survey
   d. Vital Sign Measurement

CHAPTER SIX
PATIENT MANAGEMENT WITH NUTRITIONAL NEEDS

Overview

Sometimes it's necessary to offer nutrition using artificial food that has been precisely created to deliver the correct amount of fats, proteins, carbohydrates, vitamins, and minerals for individuals who have trouble swallowing or digesting food. Enteral Nutrition is the process of delivering artificial preparations into the gastrointestinal tract for regular absorption. As an alternative, they can be injected directly into the bloodstream using a drip to avoid the digestive system. This method is called parenteral Nutrition (PN).

Enteral Nutrition

Enteral Nutrition (EN) is a therapy for providing nutrition through the digestive tract using a special hose (feeding tube). it be given through the nasal passages of the stomach (nasogastric tube) or the nose-gut (nasoduodenal). tube or nasojejunal route. EN can also be given with bolus method or by infusion via an enteral infusion pump.

since development of medical science, making EN became one of intervention in fulfilling nutrition in patients who cannot consuming food orally. Early EN will provide benefits such as minimizing the catabolic response, reducing complications of infection, improve patient tolerance, maintain intestine integrity and provide the right source of energy for the intestine at the time of illness.

EN is given to patients who need it nutritional intake with a functioning digestive tract, such as in patients of AIDS/HIV with malnutrition, cachexia due to heart disease or cancer, loss of consciousness/coma, dysphagia/esophageal obstruction, anorexia in severe infections, surgery/cancer of the head or neck and disorders psychological disorders such as major depression or

anorexia nervosa. Circumstances hypermetabolism (burns, trauma, HIV infection), oral intake is not sufficient, inflammatory bowel/Crohn's disease, intubation/ventilation, maintenance efforts intestinal requirements, as in pancreatitis also need EN. patients who are receiving enteral feedings in longer time, could experience malnutrition. This is due to EN only meets 54-88% of its needs, so switching food forms should be done immediately after the patient healed and able to take food orally.

it can simply explained that EN is given to patients who cannot eat, not enough eat, or not allowed to eat(NIMH, 2022). There are several things that determine success in administering EN, which are airway protection to minimize the risk of aspiration, good gastrointestinal ability to Avoid the slow process of digestion which can cause vomiting, the minimum length of the small intestine is 100 cm to absorb enteral nutrition effectively.

Routes of Administration

1. EN by Mouth. This type of nutrition support is given to individuals who are unable to consume enough calories due to a lack of appetite, difficulty chewing, or increased energy needs brought on by sickness. In addition to any meal or drink that the patients may be able to handle, nutritional items can be consumed. Patients don't need to eat as much because these goods offer more energy and nourishment than regular diet.
2. EN by tube. The most common reasons for using this form of nutrition are as follows:
    a. Strokes or other neurological diseases that make swallowing difficult
    b. Following some types of procedures on the face, neck, throat, gullet, or stomach
    c. Gullet or stomach blockages following radiation to the neck or gullet

Initially, feeding tubes are often inserted through the nasal and passed into the gullet before lying in the stomach or small intestine. Then a gentle pump slowly pushes liquid nutrients through the tube. A gastrostomy can be performed to insert a feeding tube directly into the stomach if it is anticipated that the patient's capacity to eat will not return quickly or at all.

Recommendation

a. Optimal time to give EN

   Once a patient is admitted to the hospital, especially the intensive care unit (ICU), and is at a high risk of malnutrition or is already malnourished, EN should be started within 24 to 48 hours. In hospitalized patients who are low risk, well-nourished, and anticipated to resume volitional oral intake within 5-7 days of admission, a delay in starting EN can be taken into consideration.

b. Indication

   Use EN as soon as practical in adult oncology patients with solid tumors who are unable to get oral nutrition or who are receiving more than 60%-75% of their recommended daily intake and who also exhibit moderate to severe malnutrition. Use EN in patients who, despite education, pharmacological, and oral supplements for more than 7 to 14 days if they were previously well-nourished, are unable to tolerate or are anticipated to be unable to tolerate >60% of their energy and protein needs by mouth.

c. Indication for Patient with GI Diseases

   When a patient is at risk or is showing signs of emerging malnutrition as a result of insufficient oral intake, EN is recommended for those with GI disorders, such as but not limited to inflammatory bowel diseases, chronic liver disease, and acute pancreatitis. Patients who have underlying malnutrition at the time of diagnosis or who are going through phases of rapid growth developmentally (especially infants and adolescents) will be more likely to need EN. The chance

of needing EN will increase if there is refractory inflammation and substantial malabsorption (particularly in patients with liver illness).

The therapeutic option of EN is also recommended for the induction of remission in Crohn's disease (CD). Children with CD should be treated with exclusive EN (EEN) as a first-line option for inducing remission. For the induction of remission in adults with CD and a high likelihood of treatment adherence, EEN may be a better option than corticosteroid therapy.

d. EN in patients with specific non-GI diseases

As soon as you can, assess all stroke patients for dysphagia to determine the best course of nutrition support. If a patient has had a stroke, oral intake is judged dangerous, and recovery is not anticipated within 7 days, start EN using a nasogastric tube (NGT). To lower the risk of nasal tube displacement, evaluate the patient for a retaining device. Consider inserting a PEG tube in patients who have a persistent inability to swallow properly for more than two to four weeks.

Start EN in Chronic Kidney Diseases (CKD) patients who are malnourished and unable to achieve their nutritional demands through food and oral supplements. Patients who are not receiving dialysis as well as those receiving peritoneal or intermittent hemodialysis are included in this. If a patient with chronic obstructive pulmonary disease (COPD) is malnourished or at risk for malnutrition and cannot meet their protein and energy needs by oral food and oral nutrition supplements, then EN should be started.

Parenteral Nutrition

Parenteral nutrition (PN) is the administration of nutrients in parenteral formulas into a vein which can be either a peripheral vein or a central vein (this method of administration is called total parenteral nutrition. Thus, parenteral nutrition bypasses the

gastrointestinal tract. Parenteral Nutrition is carried out first time by Rhoads and Dudrick in the mid-1960s.

PN should not be given in hemodynamic crises condition such as shock or uncorrected dehydration (absolute contraindication). Conditions such as respiratory failure requiring respirator assistance are relatively contraindicated considering that glucose metabolism can increase the production of carbon dioxide which exacerbates the situation.

Routes of Administration

1. Peripheral veins, which are main routes for PN. Because peripheral veins cannot be used for infusion of hypertonic parenteral solutions, peripheral parenteral nutrition should be selected as short-term (<14 days) nutritional support because it can only cover half of patient's nutritional needs.
2. Central venous, high blood flow, either through a special central venous catheter or through a central multilumen catheter placed in a special free lumen. Central or total parenteral nutrition (TPN) should be administered via the subclavian tunneling route for long term (>30 days), while other central veins may also be utilized (cephalic vein or internal jugular vein). non-tunneling can be utilized.

Recommendation

a. Optimal time to give PN

   Use peripheral PN only in situations where oral intake or EN is insufficient, clinical circumstances do not warrant putting a central venous catheter, or for brief periods of time—no longer than 10–14 days—as supplemental PN or as a bridge therapy during transition periods.

   in pre-surgery patients such as minor pre-consillectomy, does not require a special diet(Stuck *et al.*, 2008). The patient should fasting 4-5 hours before surgery. Meanwhile, patients who will undergo a herniotomy appendectomy, hemorrhoidectomy, and so on, are given a Low Leftover Diet

the day before. Major pre-surgery patients outside the gastrointestinal tract are given Low Remaining Enteral formula for 2-3 days. The last feeding in pre-major surgery is done 12-18 hours before surgery, while the last drink is 8 hours before. Gastrointestinal Pre-surgery patients are given a Low Leftover Diet for 4-5 days with the following stages:

a) 4th day before surgery given soft food
b) Day 3 before surgery given filtered food
c) Day 2 and 1 day before surgery given Low Remaining Enteral formula

b. Indication

When EN is contraindicated, the patient is unable to tolerate enough EN, or has insufficient bowel function to maintain or recover nutrition status, use PN in patients who are malnourished or at risk for malnutrition. Parenteral nourishment may be necessary for a short while or for a while under certain medical circumstances. Some patients use it as a dietary supplement, while others require intravenous calorie infusions.

c. Indication for patient with GI diseases

For the children, when the digestive tract is not accessible or functional, or when the child's nutritional needs exceed what can be met with oral intake or EN support alone, PN should be used. Similar to neonates, older infants and children have lower metabolic reserves and need more energy than adults do. The need for enough nutrients for growth distinguishes juvenile patients from adult patients in a significant way. Particularly, compared to adults, babies and children have smaller protein, lipid, and glycogen storage.

As a result, it is more crucial than ever to start feeding an infant or toddler when they are young. A little amount of supplemental PN support should be given if the gastrointestinal tract cannot be relied upon to provide full

nutrition, which includes supplying appropriate nutrition for growth.

If the gastrointestinal tract is adequately functional and adequate macro- and micronutrient absorption is occurring, PN is not recommended.

When PN administration is predicted for fewer than 5 days in individuals without severe malnutrition, PN is not the recommended course of treatment. Inability to obtain venous access, situations in which the hazards of PN outweigh the benefits, and patients whose prognosis does not warrant extensive nutrition support are all relative contraindications to PN. Although renal and hepatic insufficiency are not absolute contraindications, they both call for extra caution when using lipid and amino acids.

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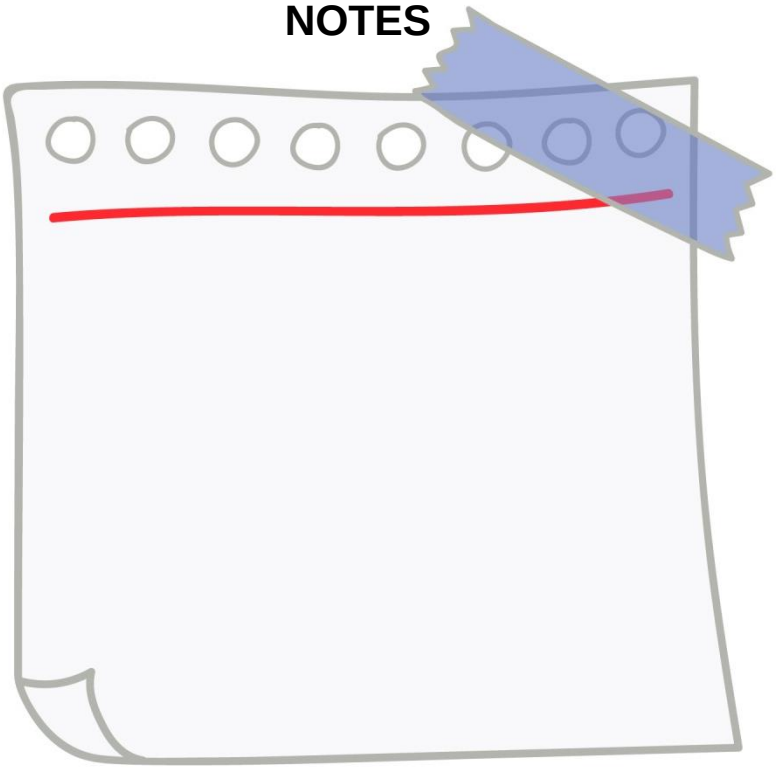
NOTES



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