

**BALANCED UNBALANCED DIET ITS IMPLICATIONS AND
TREATMENT: A REVIEW**

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ABSTRACT

A balanced diet means getting the right types and amounts of foods and drinks to supply nutrition and energy for maintaining body cells, tissues, and organs, and for supporting normal growth and development. A healthy diet is one that provides adequate levels of vitamins, minerals, protein, carbohydrate and healthy fats from a variety of foods. An unhealthy diet, in contrast, is one that contains too much saturated and Trans fats, cholesterol, sodium, added sugars and processed ingredients or contains too few nutrients. Unhealthy diets result in a poor nutrient-to-calorie ratio, which can lead to

weight gain and malnutrition as well as related health problems. In this situation, your diet doesn't provide the body with all the nutrients it needs to function optimally. In fact, malnutrition can occur if your diet is deficient in just one nutrient, so it's best to eat a variety of foods, such as fruits, vegetable, legumes, whole grains, nuts, seeds, low-fat dairy, lean meats and fish to ensure you're getting everything the body needs. A number of different nutrition disorders may arise, depending on which nutrients are under or overabundant in the diet.

KEYWORDS: Balanced diet, malnutrition, nutrition disorder, adequate level.

1. INTRODUCTION**1.1 Balanced Diet**

A well balanced diet is not something that puts a strict restriction on eating habits. Rather, it allows a healthy diet required for fitness and energy. The bad effects of crash dieting ultimately destroy the strength of your body making you weak. A well-balanced diet consists of appropriate proportions of carbohydrates, fats, proteins, fibers, vitamins and minerals.

These elements enhance the vital metabolic reactions taking place inside the body. Even the World Health Organization recommends a balanced diet for every individual. The guidelines of WHO focus on energy balance and healthy weight gain.^[1]

Balanced diet can be achieved by reducing calorie count. Keep certain foods off the bay. This includes high calorie foods rich in complex carbohydrates and saturated fatty acids. Include sufficient amount of protein, mainly dairy products. Include raw vegetables, salads and fruits in diet. Drink plenty of water every day to flush out toxins from the body. Exclude extra sodium, artificial sugars and carbohydrates from your healthy diet plan. The other way for balanced diet is to control cravings for sugar, junk foods and aerated drinks. Limit them as much as possible. Eat small meals four times a day.^[2]

1.2 Components of Balanced Diet

1.2.1 Carbohydrates

Healthy carbohydrates are the main energy sources of the body. They keep insulin and blood sugar level under control. Whole grains, brown rice, whole wheat bread, oatmeal, grains, beans, etc. come under this category. Foods included under unhealthy carbs are refined sugar, white bread, white flour, canned juices, jams, jellies, etc. Although they get digested quickly, they elevate the blood sugar level all of a sudden.

1.2.2 Fats

Monounsaturated fatty acids and polyunsaturated fatty acids are considered healthy by the body. Polyunsaturated fatty acid includes omega-3 essential fatty acids and omega 6 as well. These are mostly found in fish, like, salmon, anchovies, herring, and sardines. Sunflower, soybean, flaxseed oil, corn, sunflower are rich in polyunsaturated fatty acids while almonds, olives, hazel nut, chest nut, cashews, walnuts, sesame, pumpkin, etc are sources of monounsaturated fatty acids. You should eliminate consumption of foods high in saturated and Tran's fat. They include fried, processed and baked foods hydrogenated with vegetable oils. Candies, crackers and margarine have high amounts of saturated fats.

1.2.3 Proteins

Protein, though an indispensable part of balanced diet for kids and adults, should never be consumed in excess. There are two types of proteins, namely complementary and complete. Both are sources of amino acids, the building blocks of our body. You can combine both the types in your menu. Fish, meat, poultry, cheese, butter, eggs are laden with complete protein.

Complementary proteins are low in essential amino acids. The examples are legumes, nuts, seeds, beans, etc.

1.2.4 Fibers

Fibers help to regularize bowel movements and therefore, are vital for your body. However, only soluble fiber shows the positive effects. They dissolve easily in water and mix with the digested food in the intestine, excreted as fecal matter. Insoluble fibers cannot pass directly from the digestive system and must be avoided. Foods rich in soluble fibers are fruits, vegetables and whole grains. Guava and prunes are extremely helpful for people suffering from constipation problems. The body requires approximately 20-30 grams of dietary fiber daily.

1.2.5 Vitamins and Minerals

Vitamins assist the body to carry out all the enzymatic reactions required for health. Vitamin E enhances the texture and quality of skin and hair. Vitamin D helps in absorption of calcium in the body. Minerals like phosphorous, calcium, zinc and magnesium are crucial for strong bones and teeth. They also act as cofactors for a variety of enzymatic reactions. Foods rich in vitamins are fruits and vegetables. Apples, bananas, oranges, lemons, etc. are rich sources of vitamins. Calcium is mainly present in dairy products. Green and leafy vegetables (broccoli, cabbage, carrot, cauliflowers, beans, etc.) not only have high vitamin content but also contain high amounts of minerals.^[3]

2. BALANCE DIET CHART

Table 1: Balanced Diet Chart for Adults

Food Group	Number of Servings Each Day	Example of One Serving
Grains	Breakfast cereals, rice, pasta, bread, and noodles. Emphasize on whole grains. 1 ounce equivalent equals: 1 slice of bread or small muffin, 1 cup of dry cereal and ½ cup cooked cereal, rice, pasta	6-8 ounce equivalents (the lower number is the serving for a 2000 calorie diet, the higher number for 2400 calorie diet)
Vegetables	Tomatoes, potatoes, carrots, green peas, squash, broccoli, spinach, green beans, sweet potatoes. 1 cup raw leafy vegetables = ½ cup	2.5 - 3.5 cups
Fruits	Apricots, bananas, dates, grapes, grapefruit, oranges, orange juice, mangoes, melons, peaches, pineapples, plums, berries	1.5 - 2 cups
Dairy	Milk, yogurt, and cheese	3 cups

	The following count as 1 cup: 1½ ounces of natural cheese and 2 ounces of processed cheese	
Meat, eggs, nuts, and beans	Meat, poultry, fish, eggs, dry beans, and nuts. 1 ounce equivalent equals: 1 ounce of cooked lean meat, poultry, or fish, 1 egg, ½ oz. of nuts or seeds, 1 tbsp peanut butter, ¼ cup cooked dried beans or tofu	5.5 - 6.5 ounce equivalents
Oils	Soft margarine, low-fat mayonnaise, light salad dressing, vegetable oil (olive, canola, safflower, corn)	27 - 31 grams
Discretionary Calorie Allowance	After selecting nutrient dense foods from the above list, there is still room for a few more calories. Fat and added sugar are always counted as discretionary calories	267 - 362 calories

Table 2: Balanced Diet Chart for Children.^[4]

Food Group	Number of Servings Each Day	Example of One Serving
Bread & Cereal Group	At least 4 servings for 2-5 year olds. At least 5 servings for school children	1 medium sliced bread or 1 small bread roll or muffin or 2 large or 3 small crackers ½ cup cooked cereal or ¾ cup ready to eat breakfast cereal ½ cup cooked rice, pasta or noodles
Fruits & Vegetables	At least 2 vegetable & 2 servings of fruit for 2-5 year olds At least 3 vegetable & 2 servings of fruit for school children	A serving is what fits into the palm of your child's hand. Could be raw or cooked.
Meat, fish, eggs, chicken, dried beans & lentils	At least 1 serving every day for 2-5 year olds & school children	2 slices cooked meat (approx 100 g) ¾ cup chopped beef or casserole 1 egg or 1 medium fillet of fish or 2 drumsticks or 1 chicken leg ¾ cup cooked or canned beans, peas or lentil
Dairy products or alternative (e.g. Soy milk fortified with calcium)	At least 2 - 3 servings each day for 2-5 year olds and school children	250 ml milk 1 pottle yogurt or buttermilk (150 g) 40 g (2 slices) hard cheese 200 g cottage cheese or ricotta cheese

2.1 Healthy Diet Tips

- Having a balanced diet comprising enough fiber, pulses, whole grains, fresh fruits and vegetables.

- Avoiding food items containing oil or sugar as they do no good, but increase the cholesterol level and calorie intake in the body.
- Controlling salt intake, as excessive intake proves to be harmful for the body.
- Restricting the consumption of processed food, which comprises calories, saturated fats, added sugar, refined cereal grains, and artificial additives.
- Limiting consumption of aerated drinks and alcoholic beverages and more of water, juices and soups.

These charts cover the nutrients and calories required by people of all age groups. However, since the nutritional requirements differs from person to person, it's recommended to consult a dietitian who can make a personalized balanced diet chart according to the age, weight, sex and physical activity of the person.^[5]

3. MALNUTRITION

Malnutrition is the condition that results from taking an unbalanced diet in which certain nutrients are lacking, in excess (too high an intake), or in the wrong proportions. A number of different nutrition disorders may arise, depending on which nutrients are under or overabundant in the diet. In wealthier nations it is more likely to be caused by unhealthy diets with excess energy, fats, and refined carbohydrates.

The World Health Organization cites malnutrition as the greatest single threat to the world's public health. Improving nutrition is widely regarded as the most effective form of aid. Emergency measures include providing deficient micronutrients through fortified sachet powders or directly through supplements. WHO, UNICEF, and the UN World Food Programme recommend community management of severe acute malnutrition with ready-to-use therapeutic foods, which have been shown to cause weight gain in emergency settings.

Long term measures include fostering nutritionally dense agriculture by increasing yields, while making sure negative consequences affecting yields in the future are minimized. Recent efforts include aid to farmers. Malnutrition has shown to be an important concern in women, children, and the elderly. Because of pregnancies and breastfeeding, women have additional nutrient requirements. Children can be at risk for malnutrition even before birth, as their nutrition levels are directly tied to the nutrition of their mothers. Breastfeeding can reduce rates of malnutrition and mortality in children, and educational programs for mothers could have a large impact on these rates.^[6]

4. CLASSIFICATION

1. Beriberi
2. Pellagra
3. Rickets
4. Scurvy
5. Kwashiorkor
6. Marasmus
7. Anemia
8. Goiter
9. Hyponatremia
10. Vitamin Deficiency

5. Dietary disorders and their management

5.1 Beriberi

Beriberi is a nervous system ailment caused by a deficiency in vitamin B in the diet. Thiamine is involved in the breakdown of molecules such as glucose and is also found on the membranes of neurons. Symptoms of beriberi include severe lethargy and fatigue, together with complications affecting the cardiovascular, nervous, muscular, and gastrointestinal systems.

5.1.1Types

- Dry beriberi
- Wet beriberi
- Infantile beriberi

5.1.2Causes

Beriberi is caused by a lack of thiamine (vitamin B₁). Thiamine occurs naturally in unrefined cereals and fresh foods, particularly whole grain bread, fresh meat, legumes, green vegetables, fruit, milk, etc. Beriberi is therefore common in people whose diet excludes these particular types of nutrition e.g. as a result of famine.

5.1.3Treatment

The goal of treatment is to provide the thiamine the body is lacking. This is done with thiamine supplements which are given by injection or administered orally. Other vitamins may also be recommended to help.

Subsequent blood tests will determine if the thiamine supplements are being effective.

Treatment for beriberi is with thiamine hydrochloride, either in tablet form or injection. A rapid and dramatic recovery within hours can be made when this is administered to patients, and their health can be improved within an hour of starting treatment. In emergency situations where concentrated thiamin supplements are unavailable, feeding the patient with a thiamin-rich diet (e.g. whole grain brown bread) will lead to recovery, though at a much slower rate.^[7]

5.2 Pellagra

Pellagra is a vitamin deficiency disease most commonly caused by a chronic lack of niacin (vitamin B₃) in the diet. It can be caused by decreased intake of niacin or tryptophan,^[1] and possibly by excessive intake of leucine. It may also result from alterations in protein metabolism in disorders such as carcinoid syndrome. A deficiency of the amino acid lysine can lead to a deficiency of niacin, as well.

5.2.1 Pathophysiology

Pellagra can develop according to several mechanisms, all of which ultimately revolve around niacin deficiency. The first is simple dietary lack of niacin. Second, it may result from deficiency of tryptophan, an essential amino acid found in meat, poultry, fish, and eggs that the body converts into niacin. Third, it may be caused by excess leucine, though the relationship is unclear.

5.2.2 Treatment and Prevention of Pellagra

Pellagra is easily treated through receiving doses of niacin, although it must be done carefully as overdosing on niacin can be very dangerous. Niacin in high amounts is considered toxic to the body and can cause serious consequences if too much is administered and too quickly. However, preventing the disease is done simply through maintaining a properly balanced diet. Most all plant and animal foods are rich in niacin, so it is not difficult for those in a developed country to receive the proper amounts just by eating normally. Foods that are especially high in niacin are yeast, all kinds of meat especially liver and fish, any kind of beans or soy products such as kidney beans, green beans, pinto beans, tofu and soy beans, milk and green leafy vegetables like lettuce, kale and spinach. Seeds are another good source of niacin, like sunflower seeds, which also make a great snack.^[8]

5.3 Kwashiorkor

Kwashiorkor is an acute form of childhood protein-energy malnutrition characterized by edema, irritability, anorexia, ulcerating dermatoses, and an enlarged liver with fatty infiltrates. The insufficient protein consumption, but with sufficient calorie intake, distinguishing it from Marasmus. A kwashiorkor case occurs in areas of famine or poor food supply. Cases in the developed world are rare.

Breast milk contains proteins and amino acids vital to a child's growth. In at-risk populations, kwashiorkor may develop after a mother weans her child from breast milk, replacing it with a diet high in carbohydrates, especially starches, but deficient in protein.

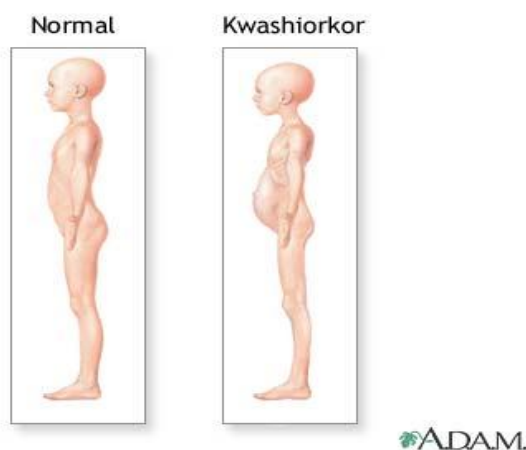


Fig. no. 1 Kwashiorkor sign.

5.3.1 Signs and symptoms

One of many kwashiorkor cases in relief camps during the Nigerian–Biafran War

The defining sign of kwashiorkor in a malnourished child is pedal edema (swelling under the skin). Other signs include a distended abdomen, an enlarged liver with fatty infiltrates, thinning hair, loss of teeth, skin depigmentation and dermatitis. Children with kwashiorkor often develop irritability and anorexia.

Victims of kwashiorkor fail to produce antibodies following vaccination against diseases, including diphtheria and typhoid. Generally, the disease can be treated by adding protein to the diet; however, it can have a long-term impact on a child's physical and mental development, and in severe cases may lead to death.

5.3.2 Treatment.^[8]

Getting more calories and protein will correct kwashiorkor, if treatment is started early enough. However, children who have had this condition will never reach their full potential for height and growth.

Treatment depends on the severity of the condition. People who are in shock need immediate treatment to restore blood volume and maintain blood pressure.

Calories are given first in the form of carbohydrates, simple sugars, and fats. Proteins are started after other sources of calories have already provided energy. Vitamin and mineral supplements are essential. Since the person will have been without much food for a long period of time, eating can cause problems, especially if the calories are too high at first. Food must be reintroduced slowly. Carbohydrates are given first to supply energy, followed by protein foods. Many malnourished children will develop intolerance to milk sugar (lactose intolerance). They will need to be given supplements with the enzyme lactase so that they can tolerate milk products.

5.4 Scurvy

Scurvy is a disease resulting from a deficiency of vitamin C, which is required for the synthesis of collagen in humans. The chemical name for vitamin C, ascorbic acid, is derived from the Latin name of scurvy, *scorbutus*, which also provides the adjective **scorbutic** ("of, characterized by or having to do with scurvy"). Scurvy often presents itself initially as symptoms of malaise and lethargy, followed by formation of spots on the skin, spongy gums, and bleeding from the mucous membranes. Spots are most abundant on the thighs and legs, and a person with the ailment looks pale, feels depressed, and is partially immobilized. As scurvy advances, there can be open, suppurating wounds, loss of teeth, jaundice, fever, neuropathy and death.

Today scurvy is known to be caused by a nutritional deficiency, until the isolation of vitamin C and direct evidence of its link to scurvy in 1932, numerous theories and treatments were proposed, often on little or no experimental data. This inconsistency is attributed to the lack of vitamin C as a distinct concept, an inability to reliably link different foods (notably present in fresh citrus, watercress, and organ meat) to scurvy.

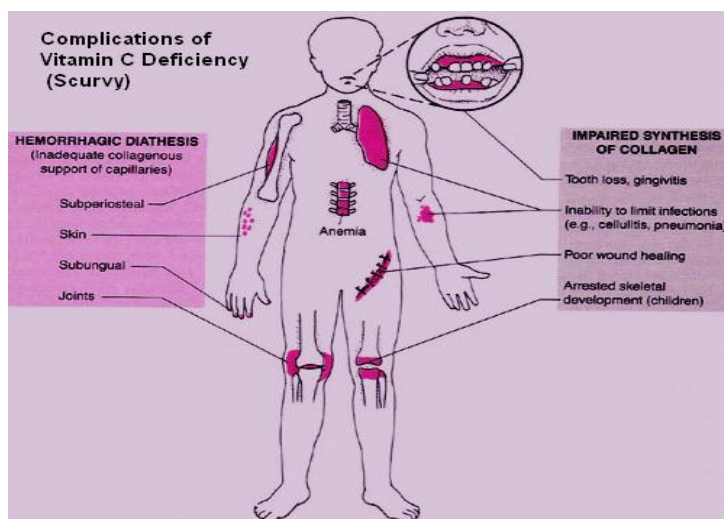


Fig. no. 2 Scurvy

5.4.1 Cause

Scurvy or subclinical scurvy is caused by the lack of vitamin C. In modern Western societies, scurvy is rarely present in adults, although infants and elderly people are affected. Vitamin C is destroyed by the process of pasteurization, so babies fed with ordinary bottled milk sometimes suffer from scurvy if they are not provided with adequate vitamin supplements.

5.4.2 Prevention

Scurvy can be prevented by a diet that includes certain citrus fruits such as oranges or lemons. Other sources rich in vitamin C are fruits such as blackcurrants, guava, kiwi fruit, papaya, tomatoes, bell peppers, and strawberries. It can also be found in some vegetables, such as carrots, broccoli, potatoes, cabbage, spinach and paprika. Some fruits and vegetables not high in vitamin C may be pickled in lemon juice, which is high in vitamin C. Many animal products, including liver, Muktuk (whale skin), oysters, and parts of the central nervous system, including the brain, spinal cord, and adrenal medulla, contain large amounts of vitamin C, and can even be used to treat scurvy.

Fresh meat from animals which make their own vitamin C contains enough vitamin C to prevent scurvy, and even partly treat it. This caused confusion in the early history of scurvy, since the disease was only seen in people eating long-preserved diets or canned goods, but not in people eating any sort of fresh diet, including arctic diets primarily based upon meat. In some cases (notably in French soldiers eating fresh horse meat) it was discovered that meat alone, even partly cooked meat, could alleviate scurvy.

5.4.3 Treatment

Scurvy can be treated by eating food containing vitamin C such as oranges, papaya, strawberries, lemon, and tablets with vitamin C, etc.^[8,9]

5.5 Rickets

Rickets is a softening of bones in children due to deficiency or impaired metabolism of vitamin D, phosphorus or calcium, potentially leading to fractures and deformity. Rickets is among the most frequent childhood diseases in many developing countries. The predominant cause is a vitamin D deficiency, but lack of adequate calcium in the diet may also lead to rickets (cases of severe diarrhea and vomiting may be the cause of the deficiency).

Osteomalacia is a similar condition occurring in adults, generally due to a deficiency of vitamin D. The origin of the word *rickets* is probably from the Old English word *wrickken* ('to twist'). The Greek word "rachitis" (meaning "in or of the spine") was later adapted as the scientific term for rickets, due chiefly to the words' similarity in sound.

5.5.1 Cause

The primary cause of rickets is a vitamin D deficiency. Vitamin D is required for proper calcium absorption from the gut. Sunlight, especially ultraviolet light, lets human skin cells convert Vitamin D from an inactive to active state. In the absence of vitamin D, dietary calcium is not properly absorbed, resulting in hypocalcaemia, leading to skeletal and dental deformities and neuromuscular symptoms, e.g. hyperexcitability. Foods that contain vitamin D include butter, eggs, fish liver oils, margarine, fortified milk and juice, portabella and shiitake mushrooms, and oily fishes such as tuna, herring, and salmon. A rare X-linked dominant form exists called Vitamin D resistant rickets.

Diagnosis

Rickets may be diagnosed with the help of:

- Blood tests:
 - Serum calcium may show low levels of calcium, serum phosphorus may be low, and serum alkaline phosphatase may be high.
- Arterial blood gases may reveal metabolic acidosis
- X-rays of affected bones may show loss of calcium from bones or changes in the shape or structure of the bones.
- Bone biopsy is rarely performed but will confirm rickets.

Treatment and prevention

The treatment and prevention of rickets is known as antirachitic. The most common treatment of rickets is the use of Vitamin D. However, surgery may be required to remove severe bone abnormalities^[8,9]

5.6 Marasmus

Marasmus is a form of severe malnutrition characterized by energy deficiency. A child with Marasmus looks emaciated. Body weight may be reduced to less than 80% of the average weight that corresponds to the height. Marasmus occurrence increases prior to age 1, whereas kwashiorkor occurrence increases after 18 months. It can be distinguished from kwashiorkor in that kwashiorkor is protein wasting with the presence of oedema. The prognosis is better than it is for kwashiorkor.

The word “Marasmus” comes from the Greek Marasmus ("decay").

5.6.1 Signs and symptoms

The malnutrition associated with Marasmus leads to extensive tissue and muscle wasting, as well as variable edema. Other common characteristics include dry skin, loose skin folds hanging over the buttocks (glutei) and armpit (axillae), etc. There is also drastic loss of adipose tissue (body fat) from normal areas of fat deposits like buttocks and thighs. The afflicted are often fretful, irritable, and voraciously hungry.

Marasmus is a form of severe protein deficiency and is one of the forms of protein-energy malfunction (PEM). It is a severe form of malnutrition caused by inadequate intake of proteins and calories.

5.6.2 Treatments

Treatment of Marasmus involves a special feeding and rehydration plan and close medical observation to prevent and manage complications of malnutrition. Pediatric nutrition rehabilitation centers have been established in some countries and regions to coordinate treatment of malnourished children. Intravenous fluids, oral rehydration solutions, and nasogastric feeding tubes are forms of treatment that may be used.

What are the potential complications of Marasmus?

Complications related to Marasmus or malnutrition are particularly serious in infants and young children. Lack of proper nutrition can lead to delays in physical and mental development. Complications of untreated Marasmus can be serious and may include:

- Growth problems in children
- Joint deformity and destruction
- Loss of strength
- Loss of vision and blindness
- Organ failure or dysfunction
- Unconsciousness and coma.^[10]

5.6.3 Drugs associated with Marasmus

Amoxicillin (Rx)

Mechanism of action

Derivative of ampicillin and has similar antibacterial spectrum (certain gram-positive and gram-negative organisms); similar bactericidal action as penicillin; acts on susceptible bacteria during multiplication stage by inhibiting cell wall mucopeptide biosynthesis; superior bioavailability and stability to gastric acid and has broader spectrum of activity than penicillin; less active than penicillin against *Streptococcus pneumococcal*; penicillin-resistant strains also resistant to amoxicillin, but higher doses may be effective; more effective against gram-negative organisms (eg, *N meningitidis*, *H influenzae*) than penicillin.

Absorption

Rapidly absorbed

Bioavailability: 74-92%

Peak plasma time: 1-2hr

Distribution

Most body fluids and bone, CSF <1%

Protein bound: 17-20%

Metabolism

Hepatic

Half-life: 61.3 minutes

Elimination

Excretion: Urine

5.7 Anaemia

Anemia means *lack of blood*, or decrease in number of red blood cells (RBCs) or less than the normal quantity of hemoglobin in the blood. However, it can include decreased oxygen-binding ability of each hemoglobin molecule due to deformity or lack in numerical development as in some other types of hemoglobin deficiency. Because hemoglobin (found inside RBCs) normally carries oxygen from the lungs to the capillaries, anemia leads to hypoxia (lack of oxygen) in organs. Anemia is the most common disorder of the blood. It can be classified in a variety of ways, based on the morphology of RBCs, underlying etiologic mechanisms, and discernible clinical spectra, to mention a few. The three main classes include excessive blood loss (acutely such as a hemorrhage or chronically through low-volume loss), excessive blood cell destruction (hemolytic) or deficient red blood cell production (ineffective hematopoietic).

5.7.1 Signs and symptoms

Most commonly, people with anemia report feelings of weakness, or fatigue, general malaise and sometimes poor concentration. They may also report dyspnea (shortness of breath) on exertion. In very severe anemia, the body may compensate for the lack of oxygen-carrying capability of the blood by increasing cardiac output. The patient may have symptoms related to this, such as palpitations, angina (if pre-existing heart disease is present), intermittent claudicating of the legs, and symptoms of heart failure.

On examination, the signs exhibited may include pallor (pale skin, mucosal linings and nail beds), but this is not a reliable sign. There may be signs of specific causes of anemia, e.g., koilonychias (in iron deficiency), jaundice (when anemia results from abnormal break down of red blood cells in hemolytic anemia), bone deformities or leg ulcers (seen in sickle-cell disease).

In severe anemia, there may be signs of a hyperdynamic circulation: tachycardia (a fast heart rate), bounding pulse, flow murmurs, and cardiac ventricular hypertrophy (enlargement). There may be signs of heart failure.

Pica, the consumption of non-food items such as soil, paper, wax, grass, ice, and hair, may be a symptom of iron deficiency, although it occurs often in those who have normal levels of hemoglobin.

Chronic anemia may result in behavioral disturbances in children as a direct result of impaired neurological development in infants, and reduced scholastic performance in children of school age. Restless legs syndrome is more common in those with iron-deficiency anemia.

5.7.2 Treatments for anemia

Oral iron

Iron deficiency from nutritional causes is rare in men and postmenopausal women. The diagnosis of iron deficiency mandates a search for potential sources of loss, such as gastrointestinal bleeding from ulcers or colon cancer. Mild to moderate iron-deficiency anemia is treated by oral iron supplementation with ferrous sulfate, ferrous fumarate, or ferrous gluconate. When taking iron supplements, stomach upset and/or darkening of the feces are commonly experienced. The stomach upset can be alleviated by taking the iron with food; however, this decreases the amount of iron absorbed. Vitamin C aids in the body's ability to absorb iron, so taking oral iron supplements with orange juice is of benefit.

Parenteral iron

In cases where oral iron has either proven ineffective, would be too slow (for example, pre-operatively) or where absorption is impeded (for example in cases of inflammation), Parenteral iron can be used. The body can absorb up to 6 mg iron daily from the gastrointestinal tract.

Blood transfusions

Doctors attempt to avoid blood transfusion in general, since multiple lines of evidence point to increased adverse patient clinical outcomes with more intensive transfusion strategies. The physiological principle that reduction of oxygen delivery associated with anemia leads to adverse clinical outcomes is balanced by the finding that transfusion does not necessarily mitigate these adverse clinical outcomes. Blood does have risks associated, such as disease transmission and host incompatibility, even in cases where cross matching was correctly undertaken. Each unit of blood is only equivalent to 200–250 mg iron, thus requiring several units per patient to replete iron stores. In severe, acute bleeding, transfusions of donated

blood are often lifesaving. Improvements in battlefield casualty survival are attributable, at least in part, to the recent improvements in blood banking and transfusion techniques.

Transfusion of the stable but anemic hospitalized patient has been the subject of numerous clinical trials.

Hyperbaric oxygen

Treatment of exceptional blood loss (anemia) is recognized as an indication for hyperbaric oxygen (HBO) by the Undersea and Hyperbaric Medical Society. The use of HBO is indicated when oxygen delivery to tissue is not sufficient in patients who cannot be given blood transfusions for medical or religious reasons. HBO may be used for medical reasons when threat of blood product incompatibility or concern for transmissible disease are factors. The beliefs of some religions (ex: Jehovah's Witnesses) may require they use the HBO method.

In 2002, Van Meter reviewed the publications surrounding the use of HBO in severe anemia and found all publications reported positive results.

Vitamin supplements given orally (folic acid or vitamin B₁₂) or intramuscularly (vitamin B₁₂) will replace specific deficiencies.

Erythropoiesis-stimulating agent

The motive for the administration of an Erythropoiesis-stimulating agent (ESA) is to maintain hemoglobin at the lowest level that both minimizes transfusions and best meets individual patient needs. Medical specialty professional organizations do not recommend the use of ESAs to chronic kidney disease patients who do not have hemoglobin levels greater than 10 g/dL and do not have anemia symptoms.^[11]

Drugs associated with anemia

Drug Name

Anadrol-50

BiferaRx

Chromagen

Chromagen

Epogen

Geritol

Poly-Vi-Sol

5.8 Goitre

A goiter or goiter (Latin *gutteria*, *struma*), is a swelling of the thyroid gland, which can lead to a swelling of the neck or larynx (voice box). Goiter is a term that refers to an enlargement of the thyroid (thyromegaly) and can be associated with a thyroid gland that is functioning properly or not.

Worldwide, over 90% cases of goiter are caused by iodine deficiency.

5.8.1 Signs and symptoms

Goitre associated with hypothyroidism or hyperthyroidism may be present with symptoms of the underlying disorder. For hyperthyroidism, the most common symptoms are weight loss despite increased appetite, and heat intolerance. However, these symptoms are often unspecific and hard to diagnose.

5.8.2 Treatment

Goiter is treated according to the cause. If the thyroid gland is producing too much T3 and T4, radioactive iodine is given to the patient to shrink the gland. If goitre is caused by iodine deficiency, small doses of iodide in the form of Lugol's Iodine or KI solution are given. If the goiter is associated with an underactive thyroid, thyroid supplements are used as treatment. In extreme cases, a partial or complete thyroidectomy is required.^[10]

5.9 Hyponatremia

Hyponatremia is defined as a serum level of less than 135 mEq/L and is considered severe when the serum level is below 125 mEq/L.

In the vast majority of cases, Hyponatremia occurs as a result of excess body water diluting the serum sodium.

Hyponatremia is most often a complication of other medical illnesses in which excess water accumulates in the body at a higher rate than can be excreted (for example in congestive heart failure, syndrome of inappropriate ant diuretic hormone, SIADH, or polydipsia). Sometimes it may be a result of over hydration.

In particular, sodium loss can lead to a state of volume depletion, with volume depletion serving as signal for the release of ADH (anti-diuretic hormone). As a result of ADH-stimulated water retention, blood sodium becomes diluted and Hyponatremia results.

Exercise-associated Hyponatremia (EAH), however, is not uncommon. Researchers found, for instance, that 13% of the athletes who finished the 2002 Boston Marathon were in a clinically Hyponatremia condition.

5.9.1 Signs and symptoms

Symptoms of Hyponatremia include nausea and vomiting, headache, confusion, lethargy, fatigue, appetite loss, restlessness and irritability, muscle weakness, spasms, or cramps, seizures, and decreased consciousness or coma.

Neurological symptoms often show for extremely low levels of sodium. When sodium levels in blood become too low, excess water enters cells and causes the cells to swell. Swelling in the brain is especially dangerous because the brain is confined by the skull and is unable to expand. The disorder in the brain caused by Hyponatremia is called hyponatraemic encephalopathy, and accounts for symptoms such as headache, nausea, vomiting and confusion, but can also present with seizures, respiratory arrest and non-carcinogenic pulmonary edema. Neurological symptoms most often are due to very low serum sodium levels (usually <115 mEq/L), resulting in intracerebral osmotic fluid shifts and brain edema. The presence of underlying neurological disease, like a seizure disorder, or non-neurological metabolic abnormalities, also affects the severity of neurologic symptoms.

• 5.9.2 Treatment.^[11, 12]

The treatment of Hyponatremia will depend on the underlying cause and whether the patient's volume status is hypervolemic, euvoletic, or hypovolemic. During treatment of Hyponatremia, the serum sodium should not be allowed to rise by more than 8 mmol/l over 24 hours (i.e. 0.33 mmol/l/h rate of rise). In practice, too rapid correction of Hyponatremia and thence CPM is most likely to occur during the treatment of hypervolemic Hyponatremia. In particular, once the hypervolemic state has been corrected, the signal for ADH release disappears. At that point, there will be an abrupt water diuresis (since there is no longer any ADH acting to retain the water).

Vaptan drugs

The “vaptan” class of drugs contains a number of compounds with varying selectivity, several of which are either already in clinical use or in clinical trials as of 2010.

Unselective (mixed V1A, V2).

- Conivaptan
V1A selective
- Relcovaptan
V1B selective
- Nelivaptan
V2 selective
- Lixivaptan
- Mozavaptan
- Satavaptan
- Tolvaptan

5.10 Vitamin Deficiencies^[13]

A vitamin is an organic compound required by an organism as a vital nutrient in limited amounts. An organic chemical compound (or related set of compounds) is called a vitamin when it cannot be synthesized in sufficient quantities by an organism, and must be obtained from the diet.

Vitamin generic name	Vitamin chemical name	Solubility	Deficiency disease	Food sources
Vitamin A	Retinol	Fat	Night-blindness	Orange, ripe yellow fruits, leafy vegetables, carrots, pumpkin, squash, spinach.
Vitamin B ₁	Thiamine	Water	Beriberi	Pork, oatmeal, brown rice, vegetables, potatoes, liver, eggs
Vitamin B ₂	Riboflavin	Water	Ariboflavinosis	Dairy products, bananas, popcorn, green beans.
Vitamin B ₃	Niacin	Water	Pellagra	Meat, fish, eggs, many vegetables, mushrooms, tree nuts
Vitamin B ₅	Pantothenic acid	Water	Paresthesia	Meat, broccoli, avocados
Vitamin B ₆	Pyridoxine	Water	Anaemia	Meat, vegetables, tree nuts, bananas
Vitamin B ₇	Biotin	Water	Dermatitis, enteritis	Raw egg yolk, liver, peanuts, certain vegetables
Vitamin B ₉	Folic acid	Water	Megaloblastic	Leafy vegetables, pasta, bread, cereal, liver
Vitamin B ₁₂	Cyanocobalamin	Water	Megaloblastic	Meat and other animal products

Vitamin generic name	Vitamerchemical name	Solubility	Deficiency disease	Food sources
			anaemia	
Vitamin C	Ascorbic acid	Water	Scurvy	Many fruits and vegetables, liver
Vitamin D	Cholecalciferol	Fat	Rickets and Osteomalacia	Fish, eggs, liver, mushrooms
Vitamin E	Tocopherols	Fat	Mild haemolytic anaemia	Many fruits and vegetables, nuts and seeds
Vitamin K	phylloquinone	Fat	Bleeding diathesis	Leafy green vegetables such as spinach, egg yolks, liver

6. Eating disorder

Anorexia nervosa (AN), characterized by refusal to maintain a healthy body weight, an obsessive fear of gaining weight, and an unrealistic perception of current body weight. However, some patients can suffer from Anorexia nervosa unconsciously. These patients are classified under "atypical eating disorders". Anorexia can cause menstruation to stop, and often leads to bone loss, loss of skin integrity, etc. It greatly stresses the heart, increasing the risk of heart attacks and related heart problems. The risk of death is greatly increased in individuals with this disease.

Bulimia nervosa (BN), characterized by recurrent binge eating followed by compensatory behaviors such as purging (self-induced vomiting, excessive use of laxatives/diuretics, or excessive exercise). Fasting and over exercise may also used as a method of purging following a binge.

Binge eating disorder (BED) or 'compulsive overeating', characterized by binge eating, without compensatory behavior. This type of eating disorder is even more common than Bulimia or anorexia. This disorder does not have a category of people in which it can develop. In fact, this disorder can develop in a range of ages and is unbiased to classes.

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