NUTRITIONAL DISORDERS

ABSTRACT

Nutritional disorders refer to a range of conditions that arise from imbalances or deficiencies in the nutrients essential for human health. These disorders can result from inadequate or excessive intake of nutrients, leading to a variety of health problems. The consequences of nutritional disorders are widespread, impacting growth, immune function, cognitive development, and overall well-being. These conditions often result from poor dietary habits, socioeconomic factors, lack of access to healthy foods, or underlying medical conditions that impair nutrient absorption. This chapter explores classification, clinical features, treatment and preventive measures of different nutritional disorders.

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I. INTRODUCTION

Nutritional disorders are a variety of conditions arising from nutrient imbalance due to undernutrition, overnutrition, or deficiency of essential vitamins and minerals. These disorders cause health problems such as stunted growth, a weakened immune system, and chronic diseases like cardiovascular disease and diabetes. In contrast, according to WHO, nutrition-related disorders presently rank among the greatest burdens of global health but mostly in developing countries; their nature is represented by being side by side with each other: undernutrition-overnutrition. Malnutrition, whether lack of adequate nutrients-that is, undernutrition-or too much intake of per se nutrients, overnutritionis one of the prime diseases bringing about disability and morbidity to human beings worldwide; as of 2020, WHO estimated that death occurred due to malnutrition.Nutritional deficiencies also include iron deficiency anemia, vitamin D deficiency, and iodine deficiency; these have caused illness among millions of the world's populations predominantly in those with low income. This is in contrast to over-nutrition, generally involving high caloric, nutrient-poor diets, and has recently contributed to the increasing rates of obesity and metabolic syndrome in developing and developed nations. This chapter describes nutritional disorders, their causes, clinical manifestations, and public health implications while focusing on both prevention and management strategies**.**

The common types of nutritional disorders include-

- **Malnutrition:** This is defined as insufficient consumption of nutrients, leading to deficiencies, excess, or imbalances. It can manifest in various forms.

  Undernutrition: Insufficient consumption of essential nutrients or calories, which results in weight loss, stunted growth in children, and weakened immunity.

  Overnutrition: Excessive consumption of calories, often leading to obesity and related health issues such as cardiovascular disease and diabetes.

- **Micronutrient Deficiencies:** It refers to the health conditions resulting from inadequate or excessive intake of essential vitamins and minerals. These disorders can lead to various health problems. As micro-nutrients are crucial for numerous bodily functions including immune response, bone healing and metabolic processes.

Some common types of micronutrient disorders are-

Deficiency

- Vitamin A deficiency
- Vitamin D deficiency
- Iron deficiency
- Iodine deficiency
- Vitamin C deficiency

Excess

Vitamin A toxicity

Iron overload

- **Eating Disorders:** Conditions like anorexia nervosa, bulimia and binge eating disorders, characterized by unhealthy eating patterns and body image concerns.

II. MALNUTRITION

Malnutrition occurs when the body does not receive an adequate supply of essential nutrients or lacks the proper balance of nutrients needed for health. The World Health Organization (WHO) defines malnutrition as a state of cellular imbalance, where the intake of nutrients does not meet the body's needs for growth, maintenance, and specific functions. Among the various forms of malnutrition, wasting is considered one of the most severe and life-threatening, particularly in children. According to UNICEF, wasting remains critically high in countries experiencing food insecurity and crises, where access to sufficient and nutritious food is limited. This condition, characterized by severe weight loss and muscle wasting, significantly increases the risk of death in affected populations.

Etiology and Risk Factors

- Inadequate dietary intake
  - Insufficient calories
  - Nutrient deficiency
- Socio-economic factor
  - Poverty
  - Education

- Health conditions
  - Chronic illness
  - Mental health issues
- Cultural and social influences
  - Cultural beliefs
  - Social isolation
- Environmental factors
  - Food availability
  - Natural disaster
- Age and life stage
  - Infants and children
  - Elderly
- Lifestyle factors
  - Sedentary behavior
  - Alcohol and substance abuse

Classification of Malnutrition

Malnutrition can be classified into several types based on nutrient deficiencies or excess. The main type include.

1. **Under Nutrition:** Under nutrition occurs when the body does not receive adequate amounts of nutrients, either in terms of calories or essential micronutrients (vitamins and minerals), necessary for proper growth, development, and function. It can lead to stunted growth, weakened immunity, increased vulnerability to infections, and in severe cases, death. Under nutrition is a major public health problem, especially in low- and middle-income countries, where food insecurity, poverty, and lack of access to adequate nutrition are widespread.

   - **Protein Energy Malnutrition (PEM):** Protein-energy malnutrition is a disease caused by the lack of adequate intake of protein and calories, leading to many health problems, especially among children. PEM is a form of malnutrition that generally occurs in low-income countries and is related to food insecurity, poverty, and health care.

Classification of PEM

A. Marasmus

It occurs due to severe deficiency of both calories and protein. It is also called the dry form of protein energy under nutrition.

Types of Marasmus

- **Acute Marasmus:** Rapid onset occurs due to sudden changes in diet
- **Chronic Marasmus:** Develops gradually over time due to prolonged inadequate nutrition associated with poverty or neglect
- **Infantile Marasmus:** Occurs from inadequate breastfeeding or improper practices
- **Marasmic Kwashiorkor:** It is a combination of marasmus and kwashiorkor in this, there is severe protein deficiency, edema, and weight loss.

Causes

- **Inadequate Food Intake:** Insufficient access to food due to poverty, famine, or natural disaster
- **Increased Nutritional Needs:** Such as illness, infection or recovery from any surgery can increase energy and protein needs.
- **Poor Absorption:** Gastrointestinal conditions can hinder nutrition absorption.
- Chronic diarrhea
- Burn
- Bottle feeding
- Neglect or abuse
- Cultural practices
- Socio-economic factors
- Psychological factors

Clinical Features

- **Weight Loss:** Significant loss of body weight, leading to a thin appearance
- **Muscle Wasting:** Loss of muscle mass, resulting in weakness and lethargy
- **Growth Retardation:** Stunted growth and delayed development
- **Skin Changes:** Dry, thin skin, often with a wrinkled appearance
- **Hair Changes:** Hair may become thin brittle and sometimes with a color change.
- **Reduced Subcutaneous Fat:** Loss of fat tissue, leading to prominent bones and a gaunt appearance
- **Increased Susceptibility to Infections:** Weakened immune system, making individual more prone to infection
- **Hypothermia:** Difficulty in maintaining body temperature due to lack of fat insulation
- **Diarrhea:** Often associated with malabsorption tissue
- Vitamin A deficiency
- Muscle atrophy
- Abdominal distension
- Persistent vomiting
- Failure to thrive
- Delayed wound healing

Treatment

- The treatment of marasmus focuses on gradually restoring nutritional status and identifying underlying causes.
- Start with small, easily digestible, high calorie foods to avoid re-feeding syndrome
- Slowly introduce a balance diet, rich in carbohydrates, protein, and healthy fats
- Give vitamins and minerals to correct deficiencies, particularly vitamin A iron and zinc

- Hydrate the individual with adequate fluid, especially in case of diarrhea
- Treat the underlying conditions that may be contributing to malnutrition
- Regular monitoring of weight and growth to assess progression
- Provide psychological support for care giver on proper feeding practices
- Engage with community health program

Preventive Measures

- Encourage exclusive breastfeeding for the first six months
- Encourage for appropriate weaning practices from 5 to 6 months of age
- Educate mother
- Regular health checkup for children to monitor growth and nutritional status

Complications

- Retarded growth
- Weakened immune system
- Severe muscle wasting
- Hypothermia
- Fluid and electrolyte imbalance
- Iron deficiency
- Development delay
- Re-feeding syndrome

B. Kwashiorkor

It occurs due to inadequate consumption of protein. Mostly seen in children than adults. It starts after the child has been weaned and breast milk replaced with a diet low in protein.

Causes

- Inadequate protein intake
- Inappropriate weaning practices
- Poverty or socioeconomic factors

- Chronic infections and diseases
- Cultural practices
- Poor dietary choices
- Ignorance
- Child abuse

Classification of Kwashiorkor

- **Classic:** Severe protein deficiency and edema occurs
- **Atypical:** Present with milder symptoms and less edema
- **Marasmic:** Combination of marasmus and kwashiorkor
- **Secondary:** Occurs in individual with underlying health conditions

Clinical Manifestation

- Swelling particularly in the belly, legs and feet due to fluid retention
- Children may look irritable or lethargic
- Hypo pigmented, brittle hair
- Dry flaky skin
- Failure to grow or gain weight
- Depleted muscle mass but retained subcutaneous fat
- Dehydration
- Loss of appetite
- Hepatomegaly, may cause abdominal distention
- Increased susceptibility to infections
- Dermatosis

Treatment

- High protein diet
- Gradual refeeding
- Energy-yield foods to restore weight
- Fluid in adequate amount
- Regular assessment of weight, height and nutritional status
- Educate families to understand the important of nutrition and health

2. Over Nutrition

According to the World Health Organization (WHO), over nutrition refers to the excessive consumption of nutrients and calories, which can lead to obesity and related health complications. It occurs when calorie intake surpasses the body's energy requirements, contributing to metabolic imbalances. Over nutrition is closely linked to an increased risk of several chronic conditions, including type 2 diabetes, heart disease, and certain types of cancer. The condition is often associated with an unhealthy diet, characterized by high levels of fat, sugar, and processed foods, and compounded by a sedentary lifestyle.

Overnutrition is classified into two categories;

- Overweight
- Obesity

Overweight

It refers to a condition where an individual has excess body weight relative to height. It is commonly assessed using the body mass index (BMI)

Obesity

A more severe condition characterized by a BMI of 30 or higher. It indicates a higher level of body fat.

Table 1: Classification of Overweight & Obesity

Classification	BMI Range	Description	Health Risk
Underweight	< 18.5	Inadequate body weight for height.	Increased risk of malnutrition and associated diseases.
Normal Weight	18.5 - 24.9	Healthy weight range.	The lowest risk for most health conditions.
Overweight	25.0 - 29.9	Excess body weight may lead to health complications.	Increased risk of hypertension, type 2 diabetes, etc.
Obesity Class I	30.0 - 34.9	Moderate obesity	Increased risk of

(Moderate)		with a greater risk of health complications.	metabolic syndrome, and heart disease.
Obesity Class II (Severe)	35.0 - 39.9	Severe obesity requires more intensive interventions.	High risk of heart disease, stroke, type 2 diabetes.
Obesity Class III (Morbid or Very Severe Obesity)	≥ 40.0	Morbid obesity with a very high risk of chronic conditions.	Very high risk of cardiovascular diseases, cancers, and more.

Causes

- High-calorie diet rich in sugar and fats
- Sedentary lifestyle
- Family history and genetic predisposition to weight gain
- Environmental influences
- Lack of sleep
- Drugs
- Medical condition such as Cushing syndrome

Sign or Symptoms

- Increased body weight
- Higher BMI
- Accumulation of fat around the abdomen or hips
- Increased tiredness and reduced energy level
- Difficulty in breathing during physical activities
- Pain in weight bearing joints
- Snoring or sleep apnea
- Darkened skin patches
- Feeling of low confidence related to body image
- Emotional challenges

Treatment

- Focus on balanced diet
- Consume less calories than expanded
- Reduce consumption of added sugars, sugary beverages and fats
- Regular exercises
- Monitor weight

Complications

- Type 2 DM
- Gallbladder disease
- Heart disease
- Osteoarthritis
- Stroke
- Depression
- High BP
- Metabolic syndrome

III. MICRO NUTRIENT DEFICIENCIES

1. Vitamin A

Vitamin A is a fat-soluble vitamin that plays a crucial role in maintaining healthy vision, immune function, skin integrity, and cellular growth. Deficiency in vitamin A can lead to a range of health problems, particularly affecting the eyes, immune system, and overall growth and development, especially in children. Vitamin A deficiency (VAD) is a significant public health concern, particularly in low-income countries where access to nutrient-rich foods is limited.

Causes

- **Dietary Factors:** Inadequate consumption of Vitamin A-rich foods such as dairy products, eggs, and leafy green vegetables.
- **Socioeconomic Factors:** Poverty, lack of education, and nutrition information
- **Cultural Practices:** Dietary preferences and restrictions that limit the intake of Vitamin A-rich foods.

Sign or Symptoms

- Eye-related symptoms
  - Night blindness
  - Xerophthalmia
  - Bitot's Spots
- Skin and mucus membrane
  - Dry, flaky, or rough skin
  - Dry mouth and Throat
- Susceptibility to infection because of weakened immunity
- Generalized weakness
- Growth impairment
- Reproductive problems

Treatment

- High-dose vitamin A supplements to be provided.
- In severe cases especially in young children with complications, vitamin A may be administered through injection for rapid correction.
- Intake of Vitamin A rich foods such as liver, fish oil, eggs, milk, cheese, carrot, sweet potatoes, spinach, oranges, mangoes etc.
- Aware the population about national programs that provide regular vitamin A supplements to children and pregnant women
- Regular monitor at risk population for improving health and nutritional status

2. Vitamin D

Vitamin D is a fat-soluble vitamin that is important in maintaining calcium and phosphate balance in the body, which is crucially related to bone health, immune function, and overall health. Unlike most vitamins, vitamin D can be synthesized in the body upon sunlight exposure to the skin. However, many people world wide experience vitamin D deficiency, which can cause various health problems, particularly affecting the bones and immune system.

Risk Factors

- Elderly persons older than 65 years
- Living in higher latitudes
- Person with darker skin (have higher melanin levels, can reduce vitamin d synthesis from sunlight).
- Chronic illness (such as kidney disease)
- Pregnancy and lactation
- Sedentary lifestyle
- Strict vegan diet
- Person with non-vertebral or hip fracture

Causes

- Limited sunlight exposure
- Inadequate intake of vitamin D rich foods
- Inability to absorb vitamin D from the intestines
- Obesity
- Drugs

Clinical Features

- **Rickets**

  Softening and weakening of bones

  Bowed legs or deformities of the spine

  Delayed growth and development milestone

- **Osteomalacia (In Adults):** Inadequate mineralization of bones results bone pain, tenderness, risk of fractures particularly in the hips, wrist and spine.
- **Osteoporosis:** Osteoporosis is a systemic skeletal disorder characterized by reduced bone density and deterioration of the internal structure of bone, thereby notably increasing the fragility of bones and their vulnerability to fractures. It is sometimes called a "silent disease" because it exhibits no symptoms while there is a loss of bones until a fracture occurs, often following minimal or no trauma.

Treatment

- Give Vitamin D supplements (D2 or D3). The doses are based on severity, often ranging from 800 to 2000 IU daily, but in case for significant deficiencies higher doses may be prescribed.
- Provide diet rich in vitamin D. e.g. - Egg yolks, Fortified dairy products, fatty fish etc.
- Advice to spend time in sunlight
- Regular follow up with Vitamin D level test

3. Iron Deficiencies

It is a condition in which the body is not able to produce hemoglobin due to insufficient iron. This leads to reduce oxygen transport in blood.

Etiology and Risk Factors

- Dietary Factors
  - Inadequate consumption of iron rich foods
  - Person is vegetarian or vegan without proper supplementation
- Increase demand of iron in children, pregnant lady or during heavy menstruations
- Medical problems like celiac disease or certain gastric surgeries
- Chronic blood loss
- Older persons may have risk due to dietary deficiencies or chronic condition

Clinical Manifestation

- Persistent tiredness and reduced energy level
- Paleness
- Difficulty in breathing
- Dizziness
- Cold hands and feet
- Brittle nails

Diagnosis: Complete blood count, serum ferritin and transferrin saturation tests

Treatment

- Increase intake of iron rich foods such as red meat, poultry products and fish
- Beans, lentils, tofu, dark leafy greens and vitamin C rich foods to enhance iron absorptions.
- Oral iron supplements
- Treat the underlying cause

Prevention

- Maintain a balanced diet with adequate iron
- Monitor for risk factors, especially in pregnant women and young children

4. Iodine Deficiency

It is condition occurs due to insufficiently consumption of iodine in the diet, resulting in various health problems, particularly affecting thyroid function.

Causes

- Low iodine in diet
- Use of non-iodine salts
- Regions with naturally low Iodine level
- Consumptions of goitrogenic foods in excess
- Conditions such as pregnancy, breast feeding and growth spurts in children.

Clinical Manifestation

- **Goiter:** It is an enlargement of the thyroid gland, visible as swelling in the neck.
- **Hypothyroidism:** It is a medical condition characterized by an underactive thyroid gland, which fails to produce sufficient amount of thyroid hormone.

- **Cognitive Impairment:** In severe cases, especially during pregnancy, may lead to developmental delays and intellectual disabilities in children.
- **Growth Retardation:** In children may cause stunted growth and delayed physical development.
- **Reproductive Issues:** There is increased risk of miscarriages, stillbirth & congenital abnormalities.
- **Myxedema:** Severe hypothyroidism can lead to myxedema, characterized by swelling, particularly in the face and extremities.
- **Thyroid Dysfunction:** Abnormal thyroid hormone levels can lead to various metabolic issues.

Treatment

- Use of iodized salt in cooking and food preparation.
- Administering iodine tablets or drops, especially in high-risk populations.
- Increase intake of iodine rich foods.
- Aware the public regarding various program to promote iodine fortification in staple foods.
- Regular monitoring of iodine levels in at risk population.
- Treat underlying thyroid disorders that may contribute iodine deficiency.

5. Vitamin C Deficiency

A condition occurs when there is an inadequate intake of Vitamin C, which is an essential nutrient needed to carry out various body functions. Vitamin C deficiency known as scurvy.

Causes & Risk Factor

- Inadequate dietary intake
- Malabsorption due to GI problems or surgeries
- Increased demand during pregnancy, breastfeeding or recovery from illness
- Chronic disease
- Smoking and alcohol consumption

- Elderly population
- Economically weak persons

Signs or Symptoms

- General weakness and fatigue
- Gums may become swollen tender and bleed easily
- Bruising, dry, and rough skin
- Pain or swelling in joints
- Anemia
- Irritability or depression
- Slow wound healing

Treatment

- Educate the patient to increase the intake of Vitamin C rich foods, such as citrus fruits, Kiwi, and leafy grains
- Advised to take Vitamin C supplements as per the physician's order
- Treat GI issues or other health conditions that may affect absorption
- Regular follow-up with the healthcare professional

IV. EXCESS

1. **Vitamin a Toxicity:** Vitamin A toxicity also as hypervitaminosis. It occurs when there is excessive accumulation of Vitamin A in the body.

Causes

- High dose of Vitamin A supplements
- High intake of fortified foods with vitamin A
- Medical condition like liver disease & pancreatitis
- Long-term use of some medication main interfere with vitamin A metabolism

Sign/Symptoms

- Muscle pain, Joint pain and headache
- Nausea and vomiting

- Dizziness
- Erythema, desquamation, alopecia
- Cheilitis, stomatitis sand conjuctivitis
- Visual disturbances
- Liver damage

Treatment

- Avoid foods high in Vitamin A until the levels is normalized
- Ensure to maintain hydration States
- Stop taking Vitamin A supplements immediately
- Seek Medical advice for severe symptoms or complications
- Supportive Care

2. **Iron Overload:** It is a condition also known as 'Hemochromatosis', which occurs due to excessive accumulation of iron in the body that may leads to damage in various organs, particularly the liver, heart and pancreas.

Causes

- Hereditary disorder
- Medical condition required frequent blood transfusion
- High doses of Iron Supplements
- Chronic Liver problems

Symptoms

- Fatigue & Weakness
- Joint Pain
- Abdominal pain
- Liver dysfunction
- Skin Discoloration
- Diabetes

Treatment

1. **Iron Chelation Therapy:** Medical treatment used to remove excess iron from the body. In this, chelating agents are used as medications that binds to iron in the blood stream & allows it's excretion through urine or feces.

2. **Phlebotomy:** To lower the iron level in the body, removal of blood to be done.

3. Dietary changes, reduce the intake of iron rich foods and also avoid vitamin C supplements

4. Regular blood test to assess, iron level, LFT, and others

5. Manage the associated problems

V. EATING DISORDERS

Some psychiatric disorders influence the eating pattern that negatively affect the physical and emotional health of the person. Common types include anorexia nervosa bulimia nervosa and binge eating disorders.

1. **Anorexia Nervosa:** It is a disorder characterized by lack of appetite by refusal of food, fear of weight, gain, and distorted body image often accompanied by vomiting and severe weight loss.

Etiology and Risk Factors

- Family history of psychiatric condition can increase the risk
- Neuro transmitter imbalance may influence appetite
- Hormonal changes, especially among female
- Psychological factors, body dissatisfaction, perfectionism etc.
- Cultural and environmental factors, emphasizing on thickness and beauty standards
- Disturbances in family relationship
- Life stressors
- Certain sports that emphasizing on weight

Clinical Features: Can be categorized into physical, behavioral and psychological symptoms

Physical Symptoms

- Severe weight loss (15% below the standard weight)
- Increased sensitivity to cold
- Amenorrhea
- Dry skin and hair
- Loss of sexual interest
- Bloating, constipation, and abdominal pain
- Electrolyte imbalances

Psychological Symptoms

- Intense fear of becoming obese
- Low self-esteem
- Depression and anxiety
- Diminished concentration

Behavioral Symptoms

- Severe limitation of food intake
- Extreme physical activity
- Avoid social gathering that involve eating

Diagnosis

- **Complete physical examination**
- Biochemical examinations including Complete blood count including Hb level, platelet count, cholesterol level, total protein, sodium, potassium, chloride, calcium, and fasting, blood, glucose, and blood urea, nitrogen etc.

Treatment

- Regular monitoring of vitals and weight
- Gradually reintroduction of food to restore healthy weight

Psychological Therapy: Cognitive behavior therapy, Family therapy, Individual psychotherapy

Nursing Management

- Counseling about balance diet and importance of maintaining healthy weight
- Encourage the patient to ventilate feelings of fear related to gaining family relationship and need for independence
- Encourage family members to actively participate in patient treatment process
- Educate family to avoid the discussion about weight and foods
- Supervise eating and maintain healthy balance diet of at least 3000 calorie in 24 hours
- Control vomiting for minimum two hours after food

2. Bulimia Nervosa

It is an eating disorder characterized by recurrent episodes of binge eating, followed by feeling of guilt, humiliation, depression, and self-condemnation.

Etiology and Risk Factors

- Genetic factors
- Hormonal changes
- Low self-esteem and body dissatisfaction
- Societal emphasis and cultural ideals
- Stress
- Psychiatric disorders

Clinical Features

- Physiological symptoms
  - Frequent fluctuation in weight
  - Heartburn and sore throat
  - Declaration of tooth erosion of dental enamel and dental disease
  - Esophageal irritation, bloating, constipation, or abdominal pain, and electrolyte imbalances
  - Amenorrhea
  - Enlarge salivary gland due to frequent vomiting

- Psychological symptoms
  - Perfectionism
  - Distorted body image
  - Exaggerated sense of guilt
  - Depression and anxiety
- Behavioral symptoms
  - Binge eating
  - Compensatory behavior
  - Avoid social gathering

Diagnosis

- Medical evaluation
- Psychological evaluation
- History
- Blood test

Treatment

- Psychotherapy
- Cognitive behavioral therapy to help the individual to change distorted thoughts, and behavior related to eating
- Behavior therapy to help with emotional process
- Hospitalization
- Develop structured meal to promote regular balanced eating
- SSRI's may be prescribed

Nursing Management

- Set time limit for each meal
- Encourage patient to express his feelings about his eating behavior
- Monitor vital signs, weight and electrolyte level
- Educate about the importance of balanced nutrition and healthy eating habits
- Explain the patient about risk of laxative and diuretic abuse
- Provide emotional support

Binge Eating Disorder

Binge Eating Disorder (BED) is a serious eating disorder characterized by recurrent episodes of consuming an excessive amount of food within a short period, accompanied by a sense of lack of control over eating. Unlike bulimia nervosa, individuals with BED do not engage in compensatory behaviors such as purging (vomiting or excessive exercise) to counter balance the binge eating. This lack of compensation can lead to significant physical and emotional distress and often results in long-term health consequences, including obesity and associated comorbidities.

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