



Dr. Bhasa Science

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The Science Foundation College
Uganda East Africa
Senior one to senior six

+256 778 633682 0753 143413

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A-level Food and Nutrition

SENIOR Six term 3

TOPIC 1/1: Nutrition in Rehabilitation

Competency: The learner examines the role of nutrition in promoting optimal health and quality of life for individuals with different conditions and applies this knowledge to support their rehabilitation and recovery.

Malnutrition

Malnutrition arises from the interaction of three elements: the host (individual's biology and vulnerability), the agent (causes such as inadequate diet, disease, or nutrient imbalance), and the environment (social, economic, and cultural context). These factors do not act in isolation — they reinforce each other, creating cycles of poor health and food insecurity.

The Epidemiological Triad Applied to Malnutrition

The **epidemiological triad** (host, agent, environment) is often used to explain disease dynamics. In malnutrition, it helps us understand how personal, biological, and contextual factors combine to produce nutritional deficiencies.

1. Host (Individual)

- (i) **Biological vulnerability:** Age (infants, children, elderly), pregnancy, chronic illness.
- (ii) **Genetic predisposition:** Some individuals absorb or metabolize nutrients differently.
- (iii) **Health status:** Illnesses like diarrhea or HIV/AIDS increase nutrient loss and demand.
- (iv) **Behavioral factors:** Food preferences, feeding practices, and knowledge of nutrition.

Interaction: A child with repeated infections (host factor) is more likely to suffer from protein-energy malnutrition because their body cannot retain nutrients effectively.

2. Agent (Causes of Malnutrition)

- (i) **Dietary deficiency:** Inadequate intake of calories, protein, vitamins, or minerals.
- (ii) **Disease burden:** Infections (measles, malaria, intestinal worms) increase nutrient needs or reduce absorption.
- (iii) **Food insecurity:** Lack of consistent access to safe, nutritious food.
- (iv) **Imbalance:** Excess intake of unhealthy foods leading to obesity and micronutrient deficiencies.

Interaction: Malnutrition agents act directly on the host — for example, iron deficiency anemia results from insufficient dietary iron or chronic blood loss.

3. Environment (Contextual Factors)

- (i) **Socioeconomic status:** Poverty limits access to diverse diets.
- (ii) **Cultural practices:** Food taboos, breastfeeding traditions, or gender-based food distribution.
- (iii) **Political instability:** Conflict and displacement reduce food availability.
- (iv) **Climate change:** Droughts, floods, and poor harvests affect food supply.
- (v) **Health systems:** Weak infrastructure reduces access to supplementation and treatment.

Interaction: A drought (environmental factor) reduces crop yields, leading to food scarcity (agent), which disproportionately affects children and pregnant women (host).

How They Interact

- **Host ↔ Agent:** A weak immune system (host) makes infections worse, which in turn depletes nutrients (agent).
- **Agent ↔ Environment:** Poor sanitation (environment) increases diarrheal diseases (agent), worsening malnutrition.
- **Host ↔ Environment:** Cultural feeding practices (environment) may restrict nutrient-rich foods for women (host), increasing maternal malnutrition.

Summary Table

| Element | Examples | Interaction |
|------------------------------|---|---|
| Host (Individual) | Age, health status, genetics, behavior | Determines vulnerability to malnutrition |
| Agent (Causes) | Poor diet, infections, nutrient imbalance | Directly causes nutrient deficiency/excess |
| Environment (Context) | Poverty, culture, climate, politics, health systems | Shapes exposure to agents and host resilience |

Key Takeaway

Malnutrition is not just about food intake — it is the **result of complex interactions** between the individual's biology, the immediate causes of nutrient imbalance, and the broader environment. Effective interventions must therefore address all three: **improving diets (agent), strengthening health and immunity (host), and tackling poverty, inequality, and food systems (environment)**.

Nutrition management and rehabilitation

Nutrition management and rehabilitation are essential in treating chronic diseases, recovery from illness or surgery, and addressing deficiencies. Conditions such as diabetes, cardiovascular disease, gastrointestinal disorders, kidney disease, cancer, and malnutrition itself require tailored dietary interventions to restore health, prevent complications, and support recovery.

Key Health Conditions Requiring Nutrition Management

1. Diabetes Mellitus

Why nutrition matters: Diet controls blood glucose levels and prevents complications.

Management: Balanced intake of carbohydrates, fiber, lean protein, and healthy fats; portion control; avoidance of refined sugars.

Rehabilitation focus: Weight management, preventing neuropathy, kidney damage, and cardiovascular risks.

2. Cardiovascular Diseases (CVDs)

Why nutrition matters: Diet influences cholesterol, blood pressure, and heart health.

Management: Low saturated fat, reduced sodium, increased fruits, vegetables, and whole grains.

Rehabilitation focus: Cardiac rehab programs emphasize heart-healthy diets alongside exercise.

3. Gastrointestinal Disorders

Examples: Peptic ulcers, Crohn's disease, ulcerative colitis, irritable bowel syndrome.

Management: Tailored diets to reduce irritation (low-fiber during flare-ups, lactose-free if intolerant).

Rehabilitation focus: Restoring nutrient absorption and preventing deficiencies (iron, B12, folate).

4. Kidney Disease

Why nutrition matters: Kidneys regulate fluid and electrolyte balance.

Management: Controlled protein intake, reduced sodium, potassium, and phosphorus; adequate calories.

Rehabilitation focus: Preventing progression to end-stage renal disease and managing dialysis nutrition.

5. Cancer and Post-Cancer Recovery

Why nutrition matters: Treatment (chemotherapy, radiation) often causes appetite loss, nausea, and nutrient depletion.

Management: High-protein, calorie-dense diets; supplements for vitamins and minerals.

Rehabilitation focus: Rebuilding strength, immune support, and preventing cachexia (severe weight loss).

6. Malnutrition (Undernutrition and Overnutrition)

Why nutrition matters: Directly affects growth, immunity, and recovery.

Management: Nutritional rehabilitation with balanced diets, fortified foods, or supplements.

Rehabilitation focus: Restoring nutrient stores, preventing relapse, and addressing underlying causes (poverty, disease, poor feeding practices).

7. Obesity and Metabolic Syndrome

Why nutrition matters: Excess weight increases risk of diabetes, hypertension, and heart disease.

Management: Calorie reduction, portion control, increased physical activity, behavior change.

Rehabilitation focus: Long-term lifestyle modification to sustain weight loss.

8. Liver Disease

Examples: Cirrhosis, hepatitis.

Management: Adequate protein (unless contraindicated), reduced alcohol, vitamin supplementation.

Rehabilitation focus: Preventing muscle wasting and managing fluid retention.

9. Post-Surgical Recovery

Why nutrition matters: Healing requires protein, vitamins (C, A, zinc), and hydration.

Management: High-protein diets, soft foods if chewing/swallowing is impaired.

Rehabilitation focus: Tissue repair, immune support, and regaining strength.

Summary Table

| Condition | Nutrition Role | Rehabilitation Focus |
|----------------|---------------------------------------|-----------------------|
| Diabetes | Control blood sugar | Prevent complications |
| CVDs | Manage cholesterol & BP | Heart-healthy rehab |
| GI Disorders | Reduce irritation, restore absorption | Prevent deficiencies |
| Kidney Disease | Balance electrolytes, protein | Slow progression |
| Cancer | Support immunity, prevent cachexia | Strength recovery |
| Malnutrition | Restore nutrients | Prevent relapse |
| Obesity | Weight management | Lifestyle change |
| Liver Disease | Support metabolism | Prevent wasting |
| Post-Surgery | Aid healing | Tissue repair |

Key Takeaway

Nutrition management is not “one-size-fits-all.” Each health condition requires **specific dietary strategies** to address its unique challenges. Rehabilitation focuses on restoring strength, preventing complications, and supporting long-term health.

Signs and symptoms of metabolic disorder and malnutrition

1. Metabolic Disorders

Metabolic disorders occur when the body cannot properly process nutrients or energy.

(i) Phenylketonuria (PKU)

Signs: Musty odor in breath/urine, fair skin and blue eyes (due to lack of melanin), developmental delays.

Symptoms: Intellectual disability if untreated, seizures, behavioral problems.

(ii) Obesity (metabolic syndrome)

Signs: Excess body fat, large waist circumference.

Symptoms: Fatigue, breathlessness, joint pain, increased risk of diabetes and hypertension.

2. Malnutrition

Malnutrition includes both undernutrition and overnutrition.

(i) Undernutrition

Signs: Stunted growth in children, thin body frame, muscle wasting.

Symptoms: Fatigue, weakened immunity, frequent infections, delayed wound healing.

(ii) Overnutrition (e.g., obesity)

Signs: Excess weight, fat accumulation.

Symptoms: Increased risk of heart disease, diabetes, hypertension.

3. Injury and Stress

Physical trauma and psychological stress affect nutrition and recovery.

(i) **Burns**

Signs: Redness, blistering, charred skin depending on severity.

Symptoms: Severe pain, fluid loss, risk of infection, increased metabolic demand.

(ii) **Stress (psychological/physiological)**

Signs: Restlessness, irritability, sleep disturbances.

Symptoms: Headaches, digestive issues, fatigue, weakened immunity.

4. Gastrointestinal Disorders

These affect digestion, absorption, and gut health.

(i) **Ulcers (peptic ulcers)**

Signs: Abdominal pain (often burning), bloating.

Symptoms: Nausea, vomiting, indigestion, sometimes blood in stool/vomit.

(ii) **Lactose Intolerance**

Signs: Bloating, gas after consuming dairy.

Symptoms: Diarrhea, abdominal cramps.

(iii) **Gluten Intolerance / Coeliac Disease**

Signs: Chronic diarrhea, weight loss, anemia.

Symptoms: Fatigue, bloating, malabsorption, skin rash (dermatitis herpetiformis).

(iv) **Colic (infants)**

Signs: Excessive crying, clenched fists, arched back.

Symptoms: Abdominal discomfort, irritability.

(v) **Diverticular Disease**

Signs: Abdominal pain (usually lower left side), bloating.

Symptoms: Constipation, diarrhea, fever if infection occurs.

5. Other Conditions

(i) **Hypertension (high blood pressure)**

Signs: Often asymptomatic (“silent killer”).

Symptoms: Headaches, dizziness, blurred vision in severe cases.

(ii) **Food Allergies**

Signs: Skin reactions (hives, eczema), swelling of lips/tongue.

Symptoms: Nausea, vomiting, diarrhea, difficulty breathing, anaphylaxis (severe reaction).

Summary Table

| Condition | Signs | Symptoms |
|----------------------|--------------------------|-------------------------------|
| PKU | Musty odor, fair skin | Developmental delay, seizures |
| Obesity | Excess fat, large waist | Fatigue, joint pain |
| Malnutrition | Stunted growth, wasting | Weak immunity, fatigue |
| Burns | Redness, blisters | Pain, fluid loss |
| Stress | Restlessness, insomnia | Headaches, fatigue |
| Ulcers | Redness, blisters | Pain, fluid loss |
| Stress | Restlessness, insomnia | Headaches, fatigue |
| Ulcers | Abdominal pain, bloating | Nausea, indigestion |
| Lactose Intolerance | Bloating, gas | Diarrhea, cramps |
| Celiac Disease | Diarrhea, anemia | Fatigue, rash |
| Colic | Crying, clenched fists | Abdominal discomfort |
| Diverticular Disease | Abdominal pain, bloating | Constipation, fever |
| Hypertension | Often silent | Headaches, dizziness |
| Food Allergies | Hives, swelling | GI upset, anaphylaxis |

Key Takeaway

- (i) **Metabolic disorders** often show systemic signs (growth, energy, development).
- (ii) **Malnutrition** manifests as growth issues, fatigue, and immune weakness.
- (iii) **Injury and stress** increase issues, fatigue, and immune weakness.
- (iv) **Injury and stress** increase metabolic demand and impair recovery.
- (v) **Gastrointestinal disorders** show digestive disturbances and malabsorption.
- (vi) **Other conditions** like hypertension and allergies may be silent or sudden but require careful monitoring.

Types and Levels of Malnutrition in Children

According to WHO indicators:

- (i) **Stunting (low height-for-age)**: Reflects chronic undernutrition and repeated infections.
- (ii) **Wasting (low weight-for-height)**: Indicates acute malnutrition, often linked to food shortages or illness.

- (iii) **Underweight (low weight-for-age):** A composite measure of both stunting and wasting.
- (iv) **Overweight/Obesity:** Increasingly common due to poor diet quality, even in low-income settings.

Levels of severity:

- (i) **Moderate Acute Malnutrition (MAM):** Weight-for-height between -2 and -3 standard deviations below WHO growth standards.
- (ii) **Severe Acute Malnutrition (SAM):** Weight-for-height below -3 SD, or presence of edema (swelling due to protein deficiency).
- (iii) **Chronic Malnutrition:** Long-term stunting and micronutrient deficiencies (iron, vitamin A, iodine).

Factors Contributing to Malnutrition in Children

From community studies and global health reports:

- (i) **Household Poverty:** Limited access to diverse, nutrient-rich foods.
- (ii) **Poor Infant Feeding Practices:** Lack of exclusive breastfeeding for the first 6 months; early introduction of low-quality foods.
- (iii) **Infections and Disease Burden:** Diarrhea, malaria, HIV/AIDS increase nutrient loss and demand.
- (iv) **Food Insecurity:** Seasonal shortages, droughts, and poor agricultural yields.
- (v) **Maternal Health and Education:** Malnourished mothers give birth to low-birth-weight infants; lack of nutrition knowledge worsens feeding practices.
- (vi) **Sanitation and Hygiene:** Poor water and sanitation increase risk of diarrheal diseases.
- (vii) **Cultural Practices:** Food taboos or unequal distribution of food within households.

Management Practices for Malnutrition

Evidence-based strategies:

1. Prevention

- (i) **Exclusive breastfeeding** for the first 6 months.
- (ii) **Complementary feeding education** for caregivers.
- (iii) **Micronutrient supplementation** (iron, vitamin A, zinc).
- (iv) **Food fortification** (iodized salt, fortified cereals).
- (v) **Community nutrition programs** promoting dietary diversity.

2. Treatment

- (i) **Community-based Management of Acute Malnutrition (CMAM):** Outpatient care for moderate cases using ready-to-use therapeutic foods (RUTF).

- (ii) **Inpatient care for SAM:** Medical stabilization, therapeutic milk (F-75, F-100), antibiotics, and micronutrient support.
- (iii) **Nutritional rehabilitation centers:** For children with complications.

3. Rehabilitation

- (i) **Growth monitoring and promotion:** Regular weighing and counseling.
- (ii) **Nutrition education for families:** Sustainable feeding practices.
- (iii) **Integration with health services:** Immunization, deworming, malaria prevention.
- (iv) **Social support programs:** Cash transfers, school feeding initiatives.

Summary Table

| Type/Level | Description | Contributing Factors | Management |
|------------------------------------|-------------------------------|------------------------------------|---|
| Stunting | Low height-for-age | Chronic undernutrition, infections | Long-term feeding programs, maternal health |
| Wasting | Low weight-for-height | Acute food shortage, illness | RUTF, CMAM, medical care |
| Underweight | Low weight-for-age | Combination of stunting/wasting | Growth monitoring, food supplementation |
| Overweight/Obesity | Excess weight | Poor diet quality, inactivity | Nutrition education, balanced diets |
| Moderate Acute Malnutrition | -2 to -3 SD weight-for-height | Food insecurity, poor feeding | Outpatient care, fortified foods |
| Severe Acute Malnutrition | Below -3 SD, edema | Severe deficiency, disease | Inpatient care, therapeutic feeding |

Key Takeaway

Malnutrition in children is multifaceted: **stunting and wasting dominate in low-resource communities**, while obesity is rising globally. Addressing it requires **integrated approaches** — tackling poverty and food insecurity, improving feeding practices, strengthening healthcare, and ensuring community-based rehabilitation.

The importance of diet therapy in the management of metabolic disorders

Diet therapy is one of the **cornerstones in managing metabolic disorders**, because these conditions often arise from the body's inability to properly process nutrients, energy, or waste products. Adjusting the diet can directly reduce symptoms, prevent complications, and improve quality of life. Let's break this down:

Why Diet Therapy Matters in Metabolic Disorders

1. Direct Control of Biochemical Imbalances

- Many metabolic disorders involve abnormal processing of carbohydrates, fats, or proteins.
- Diet therapy restricts or modifies intake of the problematic nutrient to prevent toxic buildup.

Example: **Phenylketonuria (PKU)** → strict avoidance of phenylalanine (found in protein foods) prevents brain damage.

2. Prevention of Complications

- Proper diet reduces risks of long-term damage to organs.

Examples

- (i) **Diabetes mellitus** → controlled carbohydrate intake prevents hyperglycemia and complications like neuropathy or kidney disease.
- (ii) **Hyperlipidemia** → low-fat, high-fiber diet reduces risk of cardiovascular disease.

3. Support for Growth and Development

- In children, metabolic disorders can impair growth if not managed.
- Diet therapy ensures adequate nutrition while avoiding harmful substances.

Example: **Galactosemia** → exclusion of galactose (milk sugar) prevents liver damage and supports normal growth.

4. Reduction of Medication Dependence

- In some cases, dietary control reduces the need for drugs or enhances their effectiveness.

Example: **Gout** → low-purine diet reduces uric acid levels, minimizing reliance on medication.

5. Improved Quality of Life

- Tailored diets help patients live more normally, reducing hospitalizations and complications.

Example: **Obesity/metabolic syndrome** → calorie-controlled diets improve energy, mobility, and reduce comorbidities.

Examples of Diet Therapy in Specific Disorders

| Disorder | Diet Therapy Approach | Importance |
|-----------------------|--|--|
| PKU | Low-phenylalanine diet, special medical formulas | Prevents intellectual disability |
| Diabetes | Controlled carbohydrate intake, balanced meals | Stabilizes blood sugar |
| Hyperlipidemia | Low saturated fat, high fiber | Reduces heart disease risk |
| Gout | Low-purine diet, hydration | Prevents painful flare-ups |
| Galactosemia | Avoid dairy/galactose | Prevents liver and brain damage |
| Obesity | Calorie restriction, nutrient-dense foods | Promotes weight loss and reduces risks |

Key Takeaway

Diet therapy is **not optional but essential** in metabolic disorders. It:

- (i) Corrects nutrient imbalances.
- (ii) Prevents organ damage and complications.
- (iii) Supports growth and development in children.
- (iv) Enhances overall health and quality of life.

Example of care plan for individuals with a specific metabolic

1. Care Plan for Type 2 Diabetes Mellitus

(i) Nutritional Needs

- **Balanced macronutrients:**
 - Carbohydrates: 45–50% of total calories, emphasizing complex carbs and fiber.
 - Protein: 20–25% of total calories, from lean sources (fish, poultry, legumes).
 - Fat: 25–30% of total calories, prioritizing unsaturated fats (olive oil, nuts).

- **Fiber intake:** 25–35 g/day to slow glucose absorption and improve satiety.
- **Micronutrients:** Adequate magnesium, chromium, and vitamin D to support glucose metabolism.
- **Hydration:** 6–8 glasses of water daily; limit sugary drinks.

(ii) Dietary Guidelines

- **Carbohydrate control:**
 - Choose low glycemic index (GI) foods (brown rice, oats, legumes).
 - Avoid refined sugars and processed carbs.
- **Meal timing:**
 - Regular meals and snacks to prevent blood sugar spikes.
- **Portion control:**
 - Use the “plate method”: half vegetables, one-quarter lean protein, one-quarter whole grains.
- **Limit sodium:** <2,300 mg/day to reduce hypertension risk.
- **Moderate alcohol:** If consumed, limit to 1 drink/day with food.

(iii) Lifestyle Recommendations

- **Physical activity:**
 - At least 150 minutes/week of moderate exercise (walking, cycling, swimming).
 - Include strength training twice per week.
- **Weight management:**
 - Aim for gradual weight loss if overweight (5–10% reduction improves insulin sensitivity).
- **Stress management:**
 - Practice mindfulness, yoga, or relaxation techniques to reduce cortisol (which raises blood sugar).
- **Sleep hygiene:**
 - 7–9 hours of quality sleep per night.
- **Monitoring:**
 - Regular blood glucose checks and HbA1c every 3–6 months.

One-Day Sample Meal Plan (Type 2 Diabetes)

Breakfast

- 1 bowl of **oatmeal** topped with chia seeds and blueberries
- 1 boiled egg
- 1 cup unsweetened green tea

Mid-Morning Snack

- 1 small apple
- 10 almonds

Lunch

- Grilled chicken breast (100 g)
- ½ cup brown rice
- Steamed broccoli and carrots
- Side salad with olive oil dressing

Afternoon Snack

- Low-fat Greek yogurt (unsweetened)
- 1 tbsp flaxseeds

Dinner

- Baked salmon with lemon and herbs
- Quinoa (½ cup)
- Roasted zucchini and bell peppers
- Mixed green salad

Evening Snack (if needed)

- 1 slice whole-grain toast with avocado spread

Important Points to Note

- (i) Avoid skipping meals — this can cause hypoglycemia if on medication.
- (ii) Monitor portion sizes carefully; use measuring cups or visual cues.
- (iii) Rotate protein sources (fish, poultry, legumes) to prevent monotony.
- (iv) Limit fried foods and processed snacks.
- (v) Incorporate culturally appropriate foods while maintaining balance.

Key Takeaway: Diet therapy in Type 2 Diabetes focuses on **carbohydrate control, balanced nutrition, and lifestyle changes**. A structured meal plan with regular monitoring helps maintain stable blood glucose and prevents complications.

2. Care Plan for Obesity

i) Nutritional Needs

- **Calorie control:** Reduce total energy intake by 500–750 kcal/day to promote gradual weight loss (0.5–1 kg/week).
- **Macronutrient balance:**
 - Carbohydrates: 45–50% of calories, emphasizing complex carbs and fiber.
 - Protein: 20–25% of calories, from lean sources (chicken, fish, legumes) to preserve muscle mass.
 - Fat: 25–30% of calories, prioritizing unsaturated fats (olive oil, nuts, avocado).
- **Fiber intake:** 25–35 g/day to improve satiety and regulate digestion.
- **Hydration:** 6–8 glasses of water daily; avoid sugary drinks.
- **Micronutrients:** Ensure adequate intake of vitamins and minerals (iron, calcium, vitamin D, B-complex) often lacking in calorie-restricted diets.

ii) Dietary Guidelines

- **Portion control:** Use smaller plates, measure servings, and avoid oversized portions.
- **Meal timing:** Regular meals to prevent overeating; avoid skipping meals.
- **Food choices:**
 - Emphasize fruits, vegetables, whole grains, lean proteins.
 - Limit processed foods, refined sugars, and high-fat snacks.
- **Cooking methods:** Prefer grilling, steaming, baking over frying.
- **Mindful eating:** Eat slowly, avoid distractions, recognize hunger vs. emotional eating.
- **Limit alcohol:** High in calories and may impair weight control.

iii) Lifestyle Recommendations

- **Physical activity:**
 - At least 150 minutes/week of moderate aerobic exercise (walking, cycling, swimming).
 - Strength training 2–3 times per week to preserve lean muscle.
- **Behavioral strategies:**
 - Keep food diaries, set realistic goals, monitor progress.
 - Seek support groups or counseling for emotional eating.
- **Sleep hygiene:** 7–9 hours per night; poor sleep increases appetite hormones.
- **Stress management:** Yoga, meditation, or relaxation techniques to reduce stress-related overeating.
- **Medical monitoring:** Regular check-ups for blood pressure, cholesterol, and glucose levels.

One-Day Sample Meal Plan (Obesity Management)

Breakfast

- 1 bowl of **oatmeal** topped with sliced banana and chia seeds
- 1 boiled egg
- 1 cup unsweetened herbal tea

Mid-Morning Snack

- 1 small apple
- 10 almonds

Lunch

- Grilled chicken breast (100 g)
- ½ cup quinoa
- Steamed broccoli and carrots
- Side salad with olive oil and lemon dressing

Afternoon Snack

- Low-fat Greek yogurt (unsweetened)
- 1 tbsp flaxseeds

Dinner

- Baked salmon with herbs and lemon
- ½ cup brown rice
- Roasted zucchini and bell peppers
- Mixed green salad

Evening Snack (if needed)

- 1 slice whole-grain toast with avocado spread

Important Points to Note

- Aim for **gradual, sustainable weight loss** rather than rapid dieting.
- Focus on **nutrient-dense foods** to avoid deficiencies.
- Combine diet with **regular exercise and behavioral changes**.
- Monitor progress regularly and adjust calorie intake as needed.
- Encourage **family or community support** to maintain motivation.

Thank You

Dr. Bbosa Science