FSN 246

Medical Nutrition Therapy

Modified by
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Introduction

Commonly used terms

**Nutrition:** the sum of processes involved in taking in food and using them for growth, development, and the maintenance of health. It includes eating the correct kind and amount of food, digestion and absorption of the nutrients for the maintenance of body tissue, production of energy, and elimination of wastes.

**Nutrients:** any chemical substance found in food that is used to promote body functions. They are divided into six basic groups: carbohydrate, lipids, fats, proteins, vitamins, minerals, and water.

**Essential nutrients:** nutrients that are necessary for life and cannot be synthesized by the body, therefore they must be included in the diet.

**Energy yielding nutrients:** the nutrient body can use for the production of energy. These are carbohydrates, lipids, and proteins.

**Illness and nutrition**

- Illness leads to anorexia, gastrointestinal distention, inactivity and the use of specific drugs reduces the desire for food.
- Hospitalized patients are subject to many stressors
**Nutrition care process:** is the process of planning for and meeting the nutritional needs of an individual.

**Definition of medical nutrition therapy (MNT):** is the treatment through prescription of a specific diet.

Diet therapy for a particular disease may be described in terms of

- The disorder (renal diet, diabetic diet…).
- Nutrient content (low calorie diet, low protein diet, high fat diet…).

Basic concepts of medical nutrition therapy is: **THERAPY & PREVENTION.**

**Aims of diet therapy**

- Maintain normal nutrition
- Correct nutritional deficiency
- Change body weight
- Adjust the body’s ability to use a nutrient
- Permit rest to the body or an organ

**Care providers to implement diet therapy**

Providing optimal nutrition for any patient requires a coordinate team approach

The basic team members are

- The doctor: prescribe the diet and explain the purpose of it to the patient
- The dietitian: translate the prescribed diet into foods or nutritional products.
The nurse: Make a nursing diagnosis such as growth, non-compliance, body temperature.

The counseling process

Components of the communication

- **Verbal communication**: Is important to obtain adequate dietary information. Therefore is the basis of effective treatment for dietary and behavioral changes. Poor verbal communication can lead to a possible lack of adherence to the regimen.

- **Non-verbal communication** (body language): Includes facial expression, tone of voice, posture, and body movements.

- **Listening**: Counselors must respond verbally and non-verbally in a way that shows that they listen to and understand the client.

Nutritional care record

- Is the written documentation of the nutrition care process including the interventions and activities used to meet the nutritional objectives.

- Importance of documentation
  - Ensure an effective, relevant, and thorough nutritional care.
- Serves as a communication tool between health care team.
- Serves as a basis for evaluating care provided.

**Format of medical record charting**

A problem oriented record is frequently used. This style organizes information recording to the patient primary problem. Entries into the record may be done in many styles but the most commonly used form is known as SOAP notes which contains the following elements:

**Subjective**
Information given by the patient or his family or others. These may be presented as a direct quote or paraphrased.

**Objective**
Facts that are relevant to the problem that can be confirmed by others.

**Assessment**
Evaluation or interpretation of S & O data by the care providers.

**Plan**
Specific course of action to be taken based on S, O, & A to resolve patient problem. It may include part or all of the following components:

- **Dx (diagnosis):** Further workup needed such as nutrition history, caloric count, and albumin or lipid measurement.
- **Rx (therapy):** Suggested diet or diet changes, request for eating aid, supplemental feeding.
- **Pt Ed (patient Education):** Plan for future individual or group instruction plans for follow up and major instructional material.
Fatma is referred by her physician to the nutrition outpatient clinic for counselling on weight reduction diet. While talking to Fatma you obtained a quick diet history that you feel is reasonably accurate. You calculate that the diet contains 2800 Kcal/day. Fatma told you that she is 52 y.o., dislikes fats and sweets, is fairly inactive, and eat 2 large meals a day. You measure Fatma’s height and weight and find that she is 165 cm tall & weighs 90 kg. You recommend that Fatma eat 3 meals a day, and bring a 3 day dietary record back to the clinic next week for your evaluation.

Write a SOAP progress note for the case above.

S:

O:

A:

P:
Fluid, Electrolyte and Acid-Base Balance

Homeostasis: regulatory mechanisms acting to maintain the constancy of internal environment.

Fluid balance: fluid transport is passive process resulting from diffusion along osmotic gradients established by electrolytes.

- Distribution in body: 50-60% total body weight, two compartments have same osmotic concentrations:
  - ICF: fluid compartment of all cells in body, >1/2 of total water volume is in cells, different cells vary in water content (skeletal muscles 75%, adipose 10%), acts as a water reserve
    - Major ions: K\(^+\), Mg\(^{2+}\), HPO\(_4\)\(^{2-}\), proteins.
  - ECF: fluid compartment consists of interstitial fluid (IF), plasma, lymph. Some are relatively isolated & do not easily exchange
    - Major ions: Na\(^+\), Cl\(^-\), HCO\(_3\)\(^-\)
    - Fluid shifts: rapid movement between ECF & ICF. Occur in response to osmotic changes in ECF

- Gain must equal Loss
  - Gain via digestive system & metabolic activity ~2500ml/day
  - Loss via kidneys (urine), sweat glands (insensible perspiration), & feces
    - Dehydration: loss > gain
      1. Osmotic concentration of ECF increases
      2. H\(_2\)O shifts from ICF into ECF
      3. ICF & ECF are more concentrated & have lower volumes
4. Causes: exercise in hot weather, low H₂O intake, vomiting & diarrhea

- Overhydration: gain > loss
  1. Osmotic concentration of ECF decreases
  2. H₂O shifts from ECF into ICF
  3. ICF & ECF are less concentrated & have higher volumes
  4. Causes: excess intake, hypotonic solution infused, unable to eliminate urine, endocrine disorder

**Electrolyte balance:** ions

- Total electrolyte concentration affects osmotic concentration and water balance
  - Na⁺: major ion in ECF
    - Gain-loss imbalance is most common electrolyte problem
      1. Intake across digestive epithelium based on food content
      2. Loss in urine excretion & skin perspiration
    - Change in Na⁺ level causes water movement, maintaining ECF Na⁺ concentration
      Ex. Salty meal increases Na⁺ level in digestive ECF, causing water input from digestive tract, increasing blood volume & pressure

- Individual electrolyte concentration affects cell functions
  - K⁺: major ion in ICF
    - Imbalance less common but more dangerous
    - Essential for nerve transmission
  - Ca²⁺: in ECF & ICF
• Absorbed by active transport, increased by PTH & calcitriol
• Essential in muscle contraction, neurotransmitter release, clotting, bone formation
  o Mg\(^{2+}\): mainly in ICF
    • Essential as enzyme cofactor, ATP use in contracting muscle, bone component
  o PO\(_4\)^{3-}: most important function in ICF
    • Essential for bone mineralization, ATP, phosphorylation
  o Cl\(^-\): mainly in ECF, associated with Na

**Acid-base balance:** body fluid pH is significant because proteins are sensitive to pH, both in terms of their conformation and optimal range of function. pH affects membrane structure, enzyme activity, & structural proteins.

  • H\(^+\) concentration in body fluids is the major factor contributing to pH.
  • Most H\(^+\) is result of cellular metabolism & digestive intake
  • pH of ECF ranges between 7.35 - 7.45

**Mechanisms that regulate pH and H\(^+\) concentration:**

1. Kidney excretion - excretes H\(^+\) in urine
2. Pulmonary ventilation rate - affects carbonic acid-bicarbonate buffer system
3. Buffer systems - substances that have the ability to bind or release H\(^+\) in solution

**Major Buffer Systems**

1. Protein Buffer system - proteins have carboxyl & amino groups
2. Carbonic acid-bicarbonate buffer system
3. Phosphate buffer system

Small changes in pH can produce major disturbances

1. Most enzymes function only with narrow pH ranges
2. Acid-base balance can also affect electrolytes (Na+, K+, Cl-)
3. Can also affect hormones
Standard hospital diet

- Normal nutrition is the foundation on which therapeutic diet modifications are based. The purpose of any diet is to supply needed nutrients to the body in a form it can handle.

- Modifications in the diet include changing the:
  1. Consistency
  2. Energy value
  3. Nutrient content
  4. Method of delivery of nutrition
  5. Rearrangement of the number and frequency of feedings

- All hospitals have standard diets designed for uniformity and convenience of service. These diets are used routinely for patients and serve as a foundation for more diversified therapeutic diets.

Regular Diet (House Diet, Normal Diet, General Diet, Full Diet)

- The most frequently used diet in hospitals.
- This diet has no restrictions upon food choices.
- Nutrients are required for health maintenance and not for therapy.
- Planned using the recommended dietary allowances (DRA's).
- Usually contains 1600-2200 kcal; 60-80 g protein; 80-100 g fat; 180-300 g carbohydrates.
Light Diet
- Used as intermediate between the soft and the normal diet.
- Very similar to regular diet.
- Nutritionally adequate.
- Is used for recovery from injury or illness, and for those with minor illness.
- Foods must be easy to digest with little seasoning and without heavy sauces.

Soft Diet
- This diet is moderately low in cellulose and connective tissue and low in residue (low in fiber and only 2 cups daily of all milk products).
- Used in transition between a liquid diet and a regular diet.
- Usually is ordered for postoperative patients or for those with gastrointestinal problems.
- Patients with poor dentition require a mechanically soft diet.
- The selection of food is guided by patient tolerance.
- Average composition of sot diet is 1800-2000 kcal.

Liquid Diets
- Used for patients with conditions that requires easily consumed and digested nourishment.
- Used for brief periods or patients who are having diagnostic tests, preparing for surgery, or immediately after surgery.
- May be used for patients with chewing or swallowing difficulties 1.

Clear Liquid Diet
- This diet provides fluids, some electrolytes, and around 500-600 kcal.
- The diet help maintain fluid and electrolyte balance.
- Includes clear liquids, such as tea, broth, carbonated beverages, clear fruit juices, and gelatin (jelly).
- Milk and any foods containing it and fruit juices with pulp should be omitted.
- It is inadequate in calories, fiber, and all other nutrients and it should be used for short periods only.
- Clear liquid diet is usually used postoperatively because it helps stimulate peristalsis in the postoperative patient.
- This diet is sometimes used for patients with acute gastrointestinal disturbances and for preparation for endoscopic or colonscopic tests.
- If prolonged use of this diet is required, then an appropriate low-residue and lactose-free commercial formula should be selected with added vitamins and minerals.

2. Full Liquid Diet

- Consists of foods that are liquid or semi liquid at room temperature (ex: ice cream and gelatin).
- With careful planning this diet can be nutritionally adequate, except for fiber.
- The average full liquid diet contains 1000-1500 kcal. This can be increased to a regular or even high-calorie diet.
- Protein and vitamin supplements can be added to increase nutritional content.
- This diet is used for patients who are unable to chew, swallow, or digest solid foods.
- Prolonged use can cause constipation thus a fiber supplement or a fiber containing formula may be useful.
Soft and Mechanical Soft Diet

Nutrition Facts
If a patient has a poor appetite or is physically unable to eat enough food, either diet may be deficient in calories, protein, vitamins, or minerals. The physician or registered dietitian may recommend nutritional supplements or snacks if this is the case.

Sample Menu Soft Diet

<table>
<thead>
<tr>
<th>Breakfast</th>
<th>Lunch</th>
<th>Dinner</th>
</tr>
</thead>
<tbody>
<tr>
<td>orange juice - 1/2 cup</td>
<td>spaghetti with marinara sauce - 11/2 cups</td>
<td>marinated chicken breast - 3 oz</td>
</tr>
<tr>
<td>oatmeal - 1 cup</td>
<td>Italian bread - 2 slices</td>
<td>grilled zucchini - 1/2 cup</td>
</tr>
<tr>
<td>whole wheat toast - 2 slices</td>
<td>margarine - 1 tsp</td>
<td>pasta salad - 1/2 cup</td>
</tr>
<tr>
<td>margarine - 2 tsp</td>
<td>applesauce - 1 cup</td>
<td>whole wheat roll - 1</td>
</tr>
<tr>
<td>sugar - 1 tsp</td>
<td>grape juice - 1/2 cup</td>
<td>margarine - 1 tsp</td>
</tr>
<tr>
<td>whole milk - 1 cup</td>
<td></td>
<td>peach cobbler - 1/2 cup</td>
</tr>
<tr>
<td>banana - 1 med</td>
<td></td>
<td>whole milk - 1/2 cup</td>
</tr>
</tbody>
</table>

This Sample Diet Provides the Following

<table>
<thead>
<tr>
<th>Calories</th>
<th>Fat</th>
<th>Sodium</th>
</tr>
</thead>
<tbody>
<tr>
<td>1940</td>
<td>53 gm</td>
<td>1938 mg</td>
</tr>
<tr>
<td>Protein</td>
<td>72 gm</td>
<td>Sodium</td>
</tr>
<tr>
<td>Carbohydrates</td>
<td>302 gm</td>
<td>Fiber</td>
</tr>
</tbody>
</table>

Sample Menu Mechanical Soft Diet

<table>
<thead>
<tr>
<th>Breakfast</th>
<th>Lunch</th>
<th>Dinner</th>
</tr>
</thead>
<tbody>
<tr>
<td>orange juice - 1/2 cup</td>
<td>ground spaghetti with ground meat sauce - 11/2 cups</td>
<td>ground chicken breast - 3 oz</td>
</tr>
<tr>
<td>oatmeal - 1 cup</td>
<td>ground broccoli - 1/2 cup</td>
<td>ground zucchini - 1/2 cup</td>
</tr>
<tr>
<td>sugar - 1 tsp</td>
<td>margarine - 2 tsp</td>
<td>margarine - 1 tsp</td>
</tr>
<tr>
<td>banana - 1 med</td>
<td>applesauce - 1/2 cup</td>
<td>ground pasta salad - 1/2 cup</td>
</tr>
<tr>
<td>whole milk - 1 cup</td>
<td>chocolate pudding - 1/2 cup</td>
<td>vanilla ice cream- 1/2 cup</td>
</tr>
<tr>
<td></td>
<td>chocolate milkshake - 1 cup</td>
<td>vanilla milkshake- 1 cup</td>
</tr>
</tbody>
</table>

This Sample Diet Provides the Following

<table>
<thead>
<tr>
<th>Calories</th>
<th>Fat</th>
<th>Sodium</th>
</tr>
</thead>
<tbody>
<tr>
<td>2043</td>
<td>61 gm</td>
<td>1584 mg</td>
</tr>
<tr>
<td>Protein</td>
<td>81 gm</td>
<td>Sodium</td>
</tr>
<tr>
<td>Carbohydrates</td>
<td>306 gm</td>
<td>Fiber</td>
</tr>
</tbody>
</table>
Clear Liquid Diet

Nutrition Facts
A clear liquid diet is not adequate in calories and nutrients. It should not be used for more than five days unless high-protein gelatin or other low-residue supplements are added.

<table>
<thead>
<tr>
<th>Food Groups</th>
<th>Recommend</th>
<th>Avoid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk &amp; milk products</td>
<td>none</td>
<td>all</td>
</tr>
<tr>
<td>Vegetables</td>
<td>none</td>
<td>all</td>
</tr>
<tr>
<td>Fruits</td>
<td>fruit juices without pulp</td>
<td>nectars; all fresh, canned, and frozen fruits</td>
</tr>
<tr>
<td>Breads &amp; grains</td>
<td>none</td>
<td>all</td>
</tr>
<tr>
<td>Meat or meat substitutes</td>
<td>none</td>
<td>all</td>
</tr>
<tr>
<td>Fats &amp; oils</td>
<td>none</td>
<td>all</td>
</tr>
<tr>
<td>Sweets &amp; desserts</td>
<td>gelatin, fruit ice, popsicle without pulp, clear hard candy</td>
<td>all others</td>
</tr>
<tr>
<td>Beverages</td>
<td>coffee; tea; soft drinks; water; lactose-free, low residue supplements if approved by physician</td>
<td>all others</td>
</tr>
<tr>
<td>Soups</td>
<td>bouillon, consommé fat free broth</td>
<td>all others</td>
</tr>
</tbody>
</table>

Sample Menu

<table>
<thead>
<tr>
<th>Breakfast</th>
<th>Lunch</th>
<th>Dinner</th>
</tr>
</thead>
<tbody>
<tr>
<td>• strained fruit juice 1 cup</td>
<td>• consommé 3/4 cup</td>
<td>• consommé 3/4 cup</td>
</tr>
<tr>
<td>• gelatin 1 cup</td>
<td>• strained fruit juice 1 cup</td>
<td>• strained fruit juice 1 cup</td>
</tr>
<tr>
<td>• hot tea with sugar &amp; lemon</td>
<td>• fruit ice 1/2 cup</td>
<td>• fruit ice 1/2 cup</td>
</tr>
<tr>
<td></td>
<td>• gelatin 1/2 cup</td>
<td>• gelatin 1/2 cup</td>
</tr>
<tr>
<td></td>
<td>• hot tea with sugar &amp; lemon</td>
<td>• hot tea with sugar &amp; lemon</td>
</tr>
</tbody>
</table>

This Sample Diet Provides the Following

<table>
<thead>
<tr>
<th>Calories</th>
<th>Fat</th>
<th>Sodium</th>
<th>Potassium</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>virtually none</td>
<td>1500 mg</td>
<td>1440 mg</td>
</tr>
<tr>
<td>6 gm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>209 gm</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Full Liquid Diet

Nutrition Facts
The full liquid diet is low in iron, vitamin B12, vitamin A, and thiamine. It should not be used for a long period of time unless vitamins, iron, or liquid nutritional supplements are added. This diet has 1800 mg of calcium, so extra calcium is not needed.

### Food Groups

<table>
<thead>
<tr>
<th>Group</th>
<th>Recommend</th>
<th>Avoid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk &amp; milk products</td>
<td>milk, milkshakes, eggnog, ice cream, custard, pudding</td>
<td>all cheeses</td>
</tr>
<tr>
<td>Vegetables</td>
<td>all vegetable juices</td>
<td>all raw or cooked vegetables</td>
</tr>
<tr>
<td>Fruits</td>
<td>all juice or nectar</td>
<td>all fresh, frozen, or canned fruit</td>
</tr>
<tr>
<td>Breads &amp; grains</td>
<td>cooked refined cereals; farina, grits, oatmeal, cream of rice, cream of wheat</td>
<td>all other cereals, all breads</td>
</tr>
<tr>
<td>Meat or meat substitutes</td>
<td>none</td>
<td>all</td>
</tr>
<tr>
<td>Fats &amp; oils</td>
<td>butter, margarine, cream</td>
<td>all others</td>
</tr>
<tr>
<td>Sweets &amp; desserts</td>
<td>sherbet, sugar, hard candy, plain gelatin, fruit ice, honey, syrups</td>
<td>all others</td>
</tr>
<tr>
<td>Beverages</td>
<td>all</td>
<td>none</td>
</tr>
<tr>
<td>Soups</td>
<td>broth, boullon, strained creamed soups</td>
<td>all others</td>
</tr>
</tbody>
</table>

### Sample Menu

#### Breakfast
- fruit juice 1 cup
- hot cereal 1/2 cup
- eggnog 8 oz
- whole milk 8 oz
- hot tea with sugar & lemon

#### Lunch & Dinner
- strained creamed soup 3/4 cup
- juice 1 cup
- ice cream 1/2 cup
- pudding or custard 1/2 cup
- whole milk 8 oz
- hot tea with sugar & lemon
- salt/pepper

### This Sample Diet Provides the Following

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Calories</td>
<td>2100</td>
<td>Fat</td>
</tr>
<tr>
<td>Protein</td>
<td>60 gm</td>
<td>Sodium</td>
</tr>
<tr>
<td>Carbohydrates</td>
<td>290 gm</td>
<td>Potassium</td>
</tr>
</tbody>
</table>
Nutrition for Weight Management

- Imbalances between energy intake and energy expenditure lead to weight gain or loss.
- Energy Balance “Calories In = Calories Out” → Weight Maintenance

- Normal weight: is that which is appropriate for the maintenance of good health for a particular individual at a particular time.
- An estimation of one’s ideal body weight (IBW) can be determined by using the Hamwi formula “rule of thumb” method.
  - M: 152 cm – 48 kg
  - For each 2.5 cm above 152 provide 2.7 kg
  - F: 152 cm – 45 kg
  - For each 2.5 cm above 152 provide 2.2 kg
    - Large-boned individuals need a 10% addition
    - Small-boned individuals need a 10% subtraction
- Overweight: is having a weight 10-20% above IBW.
- Obesity: is having a weight more than 20% above IBW.
- Underweight: is having a weight 15-20% below IBW.

How to calculate energy requirements

In men
\[ BEE\ (kcal/d) = 66 + (13.7 \times W) + (5 \times H) - (6.8 \times A) \]

In women
\[ BEE(kcal/d) = 655 + (9.6 \times W) + (1.8 \times H) - (4.7 \times A) \]

Adjusted IBW = IBW + \( \frac{Current\ W - IBW}{4} \)
BEE is then multiplied by an activity factor.

- The medical standard used to assess obesity and underweight is the body mass index. \( BMI = \frac{\text{Weight (kg)}}{\text{Height}^2 (m^2)} \).

- BMI < 18.5 Underweight
- BMI 18.5 – 24.9 Normal
- BMI 25.0 – 29.9 Overweight
- BMI 30.0 – 34.9 Obese, class I
- BMI 35.0 – 39.9 Obese, class II
- BMI ≥ 40 Obese, class III (extreme obesity)

**Types of Body Fat**

There are 2 types of body fat, *essential* and *storage* fat. Essential fat is stored in body tissues and organs and is necessary for normal physiologic functions of the body. Storage fat is the main energy reserve of the body; it is stored as triglycerides in adipose tissue. It accumulates under the skin and around the organs.

**Types of weight gain**

Adipose tissue can increase in one of 2 ways:

1. **Hypertrophy**: Increase of the size of fat cells
2. **Hyperplasia**: Increase of the number of fat cells.

Weight gain can be a result of any one of them or a combination of both.

**Overweight and Obesity**

Overweight and obesity is a serious health hazard. It puts extra strain on heart, lungs, muscles, bones, and joints.
Health Risks of Obesity

- Obesity is associated with the presence of hypertension, coronary heart disease, diabetes mellitus, hyperlipidemia, respiratory disease, gallbladder disease and intestinal disorder.
- Increase mortality that is secondary to diseases associated with obesity.
- Obese individuals are at greater risk for accident, emotional disorders and social discrimination.

The distribution of fat is another indicator of possible health problems. Fat in the abdominal cavity (visceral fat; apple-shaped body) has been shown to be associated with a greater risk for hypertension, diabetes, CHD than fat in the thigh and hip area (pear-shaped body). According to the National Institutes of Health, a high Waist Circumference (WC) is associated with an increased risk for type 2 diabetes, dyslipidemia, hypertension and cardiovascular disease when the BMI is between 25 and 34.9. A waist circumference above 100 cm, regardless of gender, is a strong risk factor for insulin resistance. Insulin resistance is a key player in metabolic syndrome and the precursor to type 2 diabetes.

Waist-to-hip ratio can also give an indication of this risk:

\[ R = \text{Waist (cm) / Hip (cm)} \]

- Males: \( > 1 \)
- Females: \( > 0.8 \)

Increased ratio indicates increased cardiovascular disease risk and mortality.
Causes of Overweight and Obesity

1. Excess caloric intake, because of:
   - Family pattern (high calorie food).
   - Good appetite (likes to eat).
   - Ignorance of caloric value of food.
   - Excessive snacking habits.
   - Emotional eating (stress, loneliness, worry).
   - Social events with rich foods.
   - Frequent restaurant dinning with rich foods.
   - Influenced by advertising for high calorie foods.
   - Lower metabolism with increasing age but high food intake.

2. Low activity level (sedentary job, little exercise, and sleep more).

3. Hypothyroidism (rare)—reduced body metabolism.

Treatment of Obesity

Obesity can be treated by several ways: diet, behavioral modification, exercise, pharmacology, psychotherapy, and surgery.

Balanced energy-restricted diets

- Is the most reasonable method of weight reduction the diet should be nutritionally adequate except for energy.
- Fat should be retracted as much as possible.
- A caloric deficit of 500 to 1000 kcal/day of the individual total energy requirements is usually adequate.
- A reduction of 500 kcal/day for a week will lead to a loss of 1 pound per week (about 0.5kg).
- The selection of food in low calorie diet should consider adequate amount of mineral & vitamins.
- If the intake is less than 1200 kcal/day vitamins & mineral supplementation should be advised.
- The lower the caloric intake the more the importance of high quality diet.
- Exchange lists are used for planning the low calorie diet.
- Fiber may help prevent excessive energy consumption

**Behavior modifications**
- Eat sitting down at one designated place.
- Do not combine eating with other activities.
- Eat slowly.
- Use a small plate.
- Leave table as soon as eating is done.
- Stock home with healthy foods.
- Plan meals and snacks.
- Snack on fresh vegetables and fruits.
- Don’t wait too long between meals.
- Anticipate problems (e.g., parties, holidays). Reduce consumption before and after.
- Eat small portions.
- If you make a mistake, forgive yourself and continue; don’t quit.
- Weigh regularly, but not daily.
- Include daily exercise.

**Exercise**
- When physical exercise is increased with restricted calories, fat loss is greater and lean body mass is maintained.
- Current recommendation (2002) is at least 1 hour/day of moderately intense physical activity or 20-30 minutes of high-intensity activity 4-7 days/week.

**Pharmaceutical treatment of obesity (drugs)**

- Use should be limited to individuals with BMIs of 30 and above, or 27 and above with health risks factors.

- Medications currently available:
  1. **CNS-acting agent (work on appetite suppression):**
     - Catecholaminergic agents: act on the brain, increasing the availability of norepinephrine.
       1) Amphetamines: Reduced effectiveness within short time, habit forming, rarely prescribes anymore.
       2) Phenylpropanolamine: Over-the-counter, can damage blood vessels casing a hemorrhagic stroke
       3) Phentermine: Affects blood pressure, thus prescribed with caution for patients of even mild hypertension.

     - Serotonergic agents: act by increasing serotonin level in the brain.
       1) Fenfluramine
       2) Dexfenfluramine
       * Both removed from market 1997, because of side effect of valvulopathy.

- Combination of Catecholaminergic and Serotonergic agents
  Sibutramine (Meridia) – new
2. None-CNS-acting agents (work on GI tract to inhibit fat absorption)

**Orlistate (Xenical)**

Some people believe that diuretics and laxatives promote weight loss. They only cause water loss only and not fat. Excess use can cause dehydration and electrolyte imbalance.

**Surgical treatment of obesity:**

- This is usually reserved for patients with morbid obesity. Individuals with BMIs of 40 or above, or 35 and above with health risk factors.
- Some surgical procedures are used to reduce the size of the stomach.
- Gastric bypass: most of the stomach is stapled off, creating a pouch in the upper part which is attached directly to the jejunum.
- Stomach banding: stomach is also stapled and creating small gastric pouch leaving only small opening which is banded by a piece of mesh to prevent it from enlarging later on.
- Jaw wiring: wiring the jaws closed restricts eating to liquids that can be taking through a straw.
- Liposuction: the suction of fat deposits from the body through an insertion of a tube into adipose tissue. Used for spot reduction and not total weight loss.

**Common problems encountered in obesity management**

- Plateau effect: a period during a weight reduction diet, in which weight remains the same for a while and does not decrease.
- Weight cycling (yo-yo effect): when a person loses weight and gains it back over and over in short periods of time; because of crash or fad diets, and lack of change in eating habits.
Underweight

- Applicable to persons who are 15-20% or more below the ideal body weight.
- Usually is a symptom of disease therefore it should receive medical investigation.
- Undernutrition may lead to lowered function of several glands and may also weaken the immune system, leading to increased infections.

Causes

1. Insufficient caloric intake to meet needs.
2. Excessive activity.
3. Poor absorption and utilization of foods consumed.
4. A wasting disease that increases metabolic rate and energy needs (i.e. cancer, hyperthyroidism).
5. Psychological or emotional stress.

Reasons for insufficient calorie intake

1. Family pattern (low-calorie foods, few rich desserts).
2. Small appetite has many dislikes.
3. Ignorance of adequate diet.
4. Skip meals.
5. Pattern of living (tense, overactive, not enough sleep, smokes heavily).
7. Often lives alone.
8. Illness and infection (fever, diarrhea, hyperthyroidism, poor absorption).
9. Affected by commercial claims (may not get adequate diet).
Assessment and Management

- Assessment is necessary before treatment:
  - Medical tests to determine underlying disorder causing underweight.
  - Dietary assessment (will reveal the food intake habits).
  - Anthropometric data to confirm underweight.
  - Assessment of body fatness is useful.
  - Biochemical tests will detect if malnutrition is present.

- Management:
  - Underlying cause must be treated first.
  - Activity level should be modified.
  - Psychological counseling should be started.
  - Nutritional counseling and dietary change (effective only after treating cause, or if cause is inadequate intake only).
  - Weight training is advisable to increase muscle mass.

High Calorie Diets for Weight Gain

- An allowance of 500-1000 kcals should be planned for muscle growth and storage of fat (for a gain of 1 and 2 pounds per week, respectively).
- Meals should be planned and scheduled throughout the day. Snacks are usually necessary to increase energy intake.
- Intake should be gradually increased to avoid gastric discomfort.
- Examine if individuals can tolerate fat.
- Supplements of vitamins can be given as possible appetite stimulant and to replenish any previous deficit.
Suggestions for increasing calories in the diet

- Add high calorie, high fat condiments to meals or snacks, such as, mayonnaise, butter, peanut butter, cream cheese, cheese, creamy sauces, oil and salad dressings.
- Use cream instead of milk whenever possible.
- Butter breakfast toast when it is hot because more butter can be used.
- Consume cream soup instead of clear broth.
- Add jam to bread.
- Take pudding or rich deserts as snacks.
- Add ice cream to desserts.
- Have potatoes, rice, and macaroni at least twice a day.

Exercises:

1. Calculate the IBW for a 40 y.o female who is 154 cm tall and weighs 79 kg.
2. Calculate her energy needs/d.
3. You have a 35 y.o male that weighs 87 kg. He is 170 cm tall.
   Calculate the following:
   1. BMI
   2. Total energy expenditure
   3. Number of food exchanges he require
### Calculating a Meal Pattern

<table>
<thead>
<tr>
<th>Total Calories</th>
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<tbody>
<tr>
<td>Carbohydrates</td>
<td></td>
</tr>
<tr>
<td>Protein</td>
<td></td>
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<tr>
<td>Fat</td>
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</tbody>
</table>

#### Daily Meal Pattern

<table>
<thead>
<tr>
<th>Exchange</th>
<th># of Exchanges</th>
<th>Carbohydrates (g)</th>
<th>Protein (g)</th>
<th>Fat (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Milk</em> - Skim, LF, Whole</td>
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<tr>
<td>Fruit</td>
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<tr>
<td>Vegetable</td>
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<tr>
<td><strong>Subtotal</strong></td>
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<tr>
<td>Bread/Starch</td>
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<tr>
<td><strong>Subtotal</strong></td>
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<tr>
<td><em>Meat</em> - Lean, Medium, High fat</td>
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<tr>
<td>Fat</td>
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<td><strong>Total</strong></td>
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</tbody>
</table>

Circle the one used in calculating the meal pattern

#### Distribution of exchanges at meals & snacks

<table>
<thead>
<tr>
<th>Exchange</th>
<th>Total # of exchanges</th>
<th>Breakfast AM snack</th>
<th>Lunch PM Snack</th>
<th>Diner Snack</th>
<th>BT Snack</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk</td>
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<td>Fruit</td>
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<td>Vegetable</td>
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<td>Bread</td>
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<tr>
<td>Meat</td>
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<td>Fat</td>
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<td><strong>Total</strong></td>
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</table>
Anemia

- Anemia is a condition in which there is a deficiency in the size or number of erythrocytes (RBC) or in the amount of hemoglobin they contain.

- Classification is based on cell size (MCV)—macrocytic (large), normocytic (normal), microcytic (small)—and on hemoglobin content (MCH)—hypochromic (pale color) and normochromic (normal color).

- Nutritional factors of greatest importance in anemia are deficiencies of iron, vitamin $B_{12}$, and folic acid.

Iron Deficiency Anemia

- Characterized by the production of small (microcytic) erythrocytes and a diminished level of circulating hemoglobin.

- Last stage of iron deficiency.

- Represents the end point of a long period of iron deprivation.

- Normal values
  - Adult males 14 - 18 g/dl
  - Adult female 12 - 16 g/dL

Causes

1. Inadequate ingestion.
2. Inadequate absorption.
3. Inadequate utilization (GI disturbances).
4. Increased requirement for growth of blood volume (pregnancy).
5. Increased blood loss or excretion (bleeding).
6. Defects in release from stores (chronic disorders).
**Diagnosis**

1. Increased iron transferring.
2. Decreased serum ferritin and serum iron levels.
3. Decrease Hb, microcytic, hypocromic.
4. Decrease MCV, MCH, MCHC.

**Symptoms**

- Fatigue, weakness, anorexia.
- Thin spoon shaped fingernails.
- Burning and redness of mouth, smooth waxy tongue.

**Treatment of anemia**

**Supplementation**

- Ferrous forms better absorbed than ferric (ferrous sulfate, ferrous lactate, ferrous fumarate).
- Best absorbed on an empty stomach but if irritation occurs, give with meals.

**Nutritional recommendations**

- Increase absorbable iron in the diet.
- Include vitamin C at every meal.
- Include meat, fish or poultry at every meal (MFP).
- Avoid drinking tea or coffee with meals
- Improve food choices to increase amount of total dietary iron

**Factors to consider**

- Bioavailability of iron: the lower the Fe stores, the greater the rate of absorption.
- Vitamin C: binds iron to form a readily absorbed complex.
- Heme sources (meat, poultry, fish; MFP): about 15% absorbable.
- Nonheme iron (grains, vegetables, eggs): about 3% to 8% absorbable.

**Hemochromatosis**

- A genetically determined form of iron overload that results in progressive hepatic, pancreatic, cardiac, and other organ damage.
- Higher risk in people of northern European descent.
- Men tend to manifest symptoms earlier because they have no way to dispose of excess iron (menstruation, pregnancy, lactation).
- Men may develop symptoms in their 30s but may not be diagnosed until their 50s.
- Women often develop symptoms after menopause.
- Symptoms include: joint pain, fatigue, lack of energy, abdominal pain, heart problems, and abnormal pigmentation of the skin, making it look gray or bronze.

**Diagnosis and treatment**

- Testing: serum ferritin and transferrin saturation can reveal excess stores of iron; followed by HFE (genetic) test and possible liver biopsy.
- Treatment: regular phlebotomy to remove excess iron.
- Avoidance of iron supplements and sources of iron in the diet, especially heme iron.
- Avoid the use of iron cooking vessels.
Megaloblastic Anemias

- A form of anemia characterized by the presence of large, immature, abnormal red blood cell in the bone marrow.
- 95% of cases are attributable to folic acid or vitamin $B_{12}$ deficiency.

Pernicious anemia

- A macrocytic, megaloblastic anemia caused by a deficiency of vitamin $B_{12}$.
- Vitamin $B_{12}$ stores are depleted after several years of deficient diet.
- Usually secondary to lack of intrinsic factor (IF: A glycoprotein in the gastric juice that is necessary for the absorption of vitamin $B_{12}$).
- May be caused by strict vegan diet.
- Also can be caused by decreased gastric acid secretion, gastric atrophy, H-pylori, gastrectomy, disorders of the small intestine (celiac disease, regional enteritis, resections), pancreatic disease, drugs that inhibit $B_{12}$ absorption including neomycin and alcohol.

Cause

Inadequate ingestion, absorption, and utilization; increased requirement, excretion, and increased destruction by antioxidants.

Symptoms

- Fatigue, dyspnea, sore tongue, diarrhea, irritability, forgetfulness, anorexia, glossitis, and weight loss.
- Paresthesia (especially numbness and tingling in hands and feet).
- Poor muscular coordination.
- Impaired memory and hallucinations.
• Damage to the nervous system which can be permanent.

**Therapy**

• Before 1926 was incurable; until 1948 was treated with liver extract.
• Now treatment consists of injection of 100 µg of vitamin B12 once per week until resolved, then as often as necessary.
• Also can use very large oral doses or nasal gel.
• MNT: high protein diet (1.5 g/kg) with meat, liver, eggs, milk, milk products, green leafy vegetables.

**Folic acid deficiency**

• A macrocytic, megaloblastic anemia caused by a deficiency of serum folate.
• Folate stores are depleted after 2-4 months on deficient diet.
• Associated with
  o Tropical sprue (a diarrheal syndrome that is caused by an infectious organism which cases diminished secretions of HCL and IF, it occurs in many tropical areas).
  o Pregnancy and infants born to deficient mothers.
  o Alcoholics.
  o People taking medications chronically that affect folic acid absorption.
  o Malabsorption syndromes.
Cause
Inadequate ingestion, absorption, and utilization; increased requirement, excretion, and destruction; also vitamin B$_{12}$ deficiency can cause folate deficiency.

Symptoms
Fatigue, dyspnea, sore tongue, diarrhea, irritability, forgetfulness, anorexia, glossitis, and weight loss.

Therapy
- It is important to diagnose the cause of the megaloblastic anemia correctly because administration of folic acid will correct megaloblastosis from either folate or vitamin B$_{12}$ deficiency, but it will mask the neurologic damage of vitamin B$_{12}$ deficiency, allowing nerve damage to progress to the point of irreversibility.
- To replenish folate stores a dose of 1 mg/day of folate taken orally for 2-3 weeks.
- To maintain stores a minimum of 50-100 µg/day of folate should be taken.
- MNT: Intake of fresh uncooked fruits and vegetables is recommended because folate can easily be destroyed by heat. Also include dried beans, whole wheat, and liver in the diet.

Other Nutritional Anemias
- Copper deficiency anemia
- Anemia of protein-energy malnutrition
- Sideroblastic (pyridoxine-responsive) anemia
- Vitamin E–responsive (hemolytic) anemia
Nonnutritional Anemias

- Sports anemia (hypochromic microcytic transient anemia)
- Anemia of pregnancy: dilutional
- Anemia of inflammation, infection, or malignancy (anemia of chronic disease)
- Sickle cell anemia
- Thalassemias

Copper Deficiency

- Copper is required for mobilization of iron from storage sites
- In copper deficient state, result is low serum iron and hemoglobin, even when iron stores are normal
- Copper is widespread in foods and needed in tiny amounts
- Sometimes occurs in infants fed deficient formula or cow’s milk, adults and children with malabsorption or on TPN without copper
- Diagnosis is important, since more iron won’t help and may interfere with copper absorption

Sideroblastic Anemia

- Microcytic, hypochromic form
- Inherited defect of heme synthesis enzyme
- High serum and tissue iron levels
- Buildup of immature sideroblasts—hence the name
- B6 is essential—must replace 25 to 100 times the RDA; may need lifelong replacement
- Pyridoxine-responsive anemia, distinguished from anemia caused by pyridoxine deficiency
Hemolytic Anemia

- Oxidative damage to cells—lysis occurs
- Vitamin E is an antioxidant that seems to be protective.
- This anemia can occur in newborns, especially preemies.

Sports Anemia

- Transient—usually in athletes who are runners; from compression of RBCs in feet until they burst, releasing hemoglobin
- Check lab values
- Counsel about a proper diet

Sickle Cell Anemia

- Protein-energy malnutrition common; may have poor intake and increased energy needs
- Be careful not to overdo iron in diet or supplements; iron stores are often high due to frequent transfusions; avoid iron rich foods, alcohol, and ascorbic acid which enhance iron absorption
- Promote foods high in copper, zinc and folate as needs are increased due to constant replacement of erythrocytes
- Zinc supplements may be useful

Thalassemia

- Severe inherited anemia affecting mostly people of Mediterranean extraction
- Defective globin formation in hemoglobin leads to increased blood volume, splenomegaly, bone marrow expansion, facial deformities, osteomalacia, bone changes
Iron buildup due to transfusions requires chelation therapy to remove excess iron

**Medical and Nutritional Management of Anemia**

- It is important to be familiar with the etiology and treatment of nutritional and non-nutritional anemias
- Many non-nutritional anemias have nutritional implications
- It is critical to DIAGNOSE before treating anemias with nutritional or non-nutritional therapies
MNT for GI disorders

The gastrointestinal (GI) tract is where digestion and absorption of food occurs. The primary organs are the mouth, esophagus, stomach, small intestine and large intestine. The liver, gallbladder, and pancreas are accessory organs that are also involved in these processes.

Food and Gastric acidity

- Foods have a pH of 3-7 while the pH of the gastric acid is less than 1-3.
- Protein rich foods temporarily neutralize gastric acids, but they also stimulate gastric acid secretions.
- Fat reduces gastric acid secretions.
- Carbohydrates have no effect on gastric acid secretions.
- Gastric acid production is increased by coffee, tea, alcohol, tobacco, and spices such as black pepper and mustard seeds.

Gastroesophageal reflux and esophagitis

- Heart burns result from gastroesophageal reflux.
- Chronic heartburn can lead to esophagitis.
- Normally, the pressure of the lower esophageal sphincter (LES) prevents stomach contents from entering the esophagus.
- Any factor that lower the LES pressure or increase gastric pressure may favor reflux.
- Cigarette smoking, muscle relaxants, anti-inflammatory drugs, and chronic use of aspirin can lower the LES.
- Common in pregnancy, obesity, and in patients with hiatal hernia.
Therapy:
- Weight reduction in obese patients help reduce pressure on the abdomen.
- Avoid large, high fat meals; eat small frequent meals.
- Avoid eating at least 3-4 hours before bedtime.
- Avoid smoking.
- Avoid wearing tight clothes and belts.
- Sleep with the head elevated to help prevent symptoms.
- Avoid lying down, bending over, or exercising after consuming meals especially large high fat meals.
- Avoid foods that lower the pressure of the lower esophageal sphincter (LES) or increase acid production, like fat, chocolate, coffee, garlic, onion, alcohol, peppermint and spearmint.
- **For a person who has esophagitis:** Avoid irritants to the esophagus such as acidic foods like citrus fruits and juices, tomato products, and carbonated beverages. Also avoid fat, spicy food, and harsh foods (e.g. chips, crispy foods).

Hiatal Hernia
- Is an abdominal gap in the diaphragm due to weakened muscles that allows the upper portion of the stomach to protrude above the diaphragm into the chest cavity.
- This can cause food to move back into the esophagus causing gastroesophageal reflux.

Therapy:
- Aimed at decreasing symptoms of reflux or esophagitis.
- Look at therapy for gastroesophageal reflux and esophagitis.
**Peptic Ulcer**

- An ulcer is an erosion of the mucous membrane.
- Peptic ulcer may occur in the stomach (gastric ulcer) or in the duodenum (duodenal ulcer).
- The most common cause is an infection by helicobacter pylori bacteria (H. pylori).
- Can be caused by stress, excessive use of aspirin or ibuprofen, steroids, cigarette smoking, alcohol abuse.
- The pain after eating occurs when hydrochloric acid comes in contact with the exposed nerve fiber in the eroded area.

**Therapy:**

- Ulcers are treated with antibiotics for the bacteria and drugs to inhibit acid secretion.
- Antacids are used to neutralize excess acid.
- Rest and stress management are useful in treatment.
- Protein foods puffer gastric acid but at the same time simulate more gastric acid secretions.
- Milk or cream is no longer considered in the nutritional management of ulcers.
- Vitamin and mineral supplement may be given to make up for dietary inadequacies.
- Spicy foods can be taken as tolerated by patient.
- Avoid coffee, tea, caffeine, alcohol, aspirin, and cigarette smoking.
- Avoid large meals, especially before sleeping.
**Constipation**

- One of the most common intestinal problems, particularly in the elderly.
- It is cause by may reasons such as:
  - Side effect of medication.
  - Lack of exercise.
  - Ignoring the urge to defecate
  - Poor diet, low in fiber.
  - Insufficient fluid intake.
  - Chronic use of laxatives.
  - Pregnancy.

**Therapy:**

- High fiber diet; no less than 20-30g fiber per day.
- Increase fluid intake to at least 1200-1500 ml per day.
- Regular exercise.
- Do not delay response to the urge to defecate.

**Diarrhea**

- Frequent evacuation of liquid stool exceeding 300 ml, with excessive loss of fluid and electrolyte particularly sodium and potassium.
- May be cased by inflammatory disease; infections with bacteria, fungus, or virus; medications such as antibiotics; over consumption of sugars; or malnutrition.

**Therapy:**

- Fluids and electrolytes should be replaced with broths and electrolyte solutions.
• Low residue diet should be started (>20g fiber).
• Fat intake should be reduced as tolerated.
• Sugars like sucrose, fructose, and lactose should be limited.
• Use modest amounts of foods or dietary supplements containing prebiotics.
  • **Prebiotics:** food substances intended to promote the growth of certain bacteria in the intestines (fermentable fibers).
  • Most prebiotics are carbohydrates (oligosaccharides).
  • Dietary sources include bananas, apples, oats, soybeans, flaxseed, barley, wheat, green leafy vegetables, legumes, onions, and artichoke.
• Use some types of **Probiotics.**
  • **Probiotics:** sources of bacteria used to reestablish the presence of beneficial intestinal flora.
  • Food sources include yoghurt & leban.
  • The two most common bacteria added in the production of probiotic foods are lactobacilli and bifidobacteria.

**Diverticulosis and diverticulitis**
• Diverticulosis is the presence of pockets in the sides of the large intestine (colon), caused by long-term constipation and increased colonic pressure.
• About 10%-25% of patients develop diverticulitis.
• Diverticulitis is an inflammation of a diverticulum or diverticula.

**Therapy:**
• Diverticulosis: A high fiber diet is recommended both to prevent development of diverticula and to reduce the chances of existing pockets of filling with fecal matter with resulting bacterial infection
- Diverticulitis: Bed rest, antibiotics, and clear liquid diet followed by a very low residue diet are prescribed. Increase the fiber intake gradually over several weeks.

**Celiac Disease**
- Also known as gluten-sensitive enteropathy.
- It is a disorder caused by immune response to the ingestion of gluten in the small intestine.
- Cause is unknown; it is thought to be due to heredity.
- Characterized by malabsorption of virtually all nutrients.
- Symptoms include diarrhea, steatorrhea, weight loss, and malnutrition.
- Elimination of gluten from the diet gives relief.
- Gluten is a protein found in grains.

**Therapy:**
- A gluten-free diet is prescribed.
- Eliminate barley, oats, rye, wheat; semolina, and all products containing them.
- Patient is not allowed to eat bread, cereals, crackers, pasta, deserts, gravies, white sauces, breaded meat, and cream soups.
- Rice and corn are allowed.
- A reduction in fiber content is recommended.
- Medium chain triglycerides (MCT) may be used to help increase caloric content of the diet.
- Fat may be restricted until bowel function is normalized.
- Vitamin and mineral supplements are recommended.
- A low-lactose, low fructose diet may be useful in controlling symptoms in the beginning.
• Symptoms usually subside within 2-8 weeks of consuming gluten-free diet.

**Lactose intolerance**

• It is caused by a deficiency of lactase, the enzyme that digests the milk sugar lactose.
• Symptoms are bloating, flatulence, cramps, and in some cases diarrhea.

**Therapy:**

• A dietary change is required to reduce consumption of lactose containing foods.
• Complete elimination is not necessary; patients usually can tolerate 6-12g of lactose without symptoms.
• Cheese and yoghurt (but not frozen yoghurt) are usually more tolerated.
• Patients who avoid milk products should take calcium supplements.
• Lactase enzyme supplements are available and can be taken before eating lactose containing foods. Or lactase drops can be added to milk before consumption.

**Inflammatory bowel diseases (IBD)**

• Chronic conditions causing inflammation in the gastrointestinal tract.
• It involves an abnormal autoimmune response in intestinal wall in genetically predisposed individuals.
• Inflammation causes malabsorption that can leads to malnutrition.
• Acute phases occur at irregular intervals and between them patient is usually symptom free.
Symptoms include bloody diarrhea, cramps, fatigue, nausea, anorexia, anemia, malnutrition, weight loss, and growth failure.

Neither cause nor cure for these conditions is known.

The two most common types are Crohn’s disease and ulcerative colitis.

**Crohn’s disease**
- A chronic progressive disorder causing inflammation, ulcers, and thickening of intestinal walls, sometimes causing obstruction.
- It can affect any part of the GI tract from mouth to anus, but usually affects the ileum and the colon.
- Distribution of disease is usually segmented in the intestine.
- Rectal bleeding or bloody diarrhea is occasional. Steatorrhea is frequent.

**Ulcerative colitis**
- An inflammation and ulceration of the colon, rectum, or the entire large intestine.
- Distribution of disease usually continues on the intestine.
- Rectal bleeding or bloody diarrhea is common. Steatorrhea is absent.

**Therapy:**
- During acute stages corticosteroids, anti-inflammatory agents, immunosuppressive agents, and antibiotics are given.
- Low residue diet is implemented in acute stage.
- Limit sugars and caffeine, and excess fiber in the beginning.
- When tolerated diet should be somewhat high in calorie, but very high in protein (about 100g).
- Small, frequent feeding is better tolerated.
• Oral hydration supplements may be given to replace fluid and electrolyte loss.
• Vitamin and mineral supplements are recommended.
• Use of prebiotic and probiotic containing foods or supplements is recommended.
• Include omega-3 fats in food choices because they have anti-inflammatory effect.
• In cases of fat malabsorption MCT could be used to increase calories.
• Surgery may be necessary to repair, remove portions of the bowel, or create an opening to intestinal tract to permit deification (ileostomy or colostomy).

Irritable colon syndrome (IBS):
• It is not a disease but a syndrome of irregular bowel motility and increased GI tract sensitivity without metabolic cause.
• No tissue damage, no inflammation, and no immunologic involvement are present.
• Main symptoms are alternating diarrhea and constipation, abdominal pain (typically relieved by defecation). Other symptoms include bloating, gas, or mucus in the stools occurs.
• Stress may trigger symptoms.

Therapy:
• Helping patients to cope with stress, exercise should be implemented.
• Regular sleep, rest, fluid, and balanced food intake is essential.
• Avoid large meals.
• Limit intake of fat, caffeine, alcohol, and sugars such as lactose, fructose, and sorbitol.
• Use of prebiotic and probiotic containing foods or supplements is recommended.
• A generally high fiber diet may help normalize bowel habits of IBS.
• When diarrhea is present decrease fiber intake.

Residue-controlled diet
• Dietary fiber is the part of food that is not broken down by digestive enzymes.
• Some is soluble and some is insoluble.
• **Soluble (pectin, gums, mucilages);** delays GI transit, delays glucose absorption, lowers blood cholesterol. Sources are; fruit (apples, bananas, citrus, plums, peaches), broccoli, carrots, cabbage, oats, barley, and legumes (peas, beans, lentils).
• **Insoluble (Cellulose, Hemicelluloses, Lignin);** Speeds GI transit, increase fecal weight, slows starch hydrolysis, delays glucose absorption. Sources are; wheat bran, corn bran, whole grains, cereals, vegetables, fruits, and brown rice.
• Residue is the solid part of feces. It is mad up of all the undigested and unabsorbed parts of food (mainly fiber).

High fiber diet:
• Contain 30g or more fiber a day.
• Help prevent diverticulosis, constipating, hemorrhoids, and colon cancer. Also helpful in treatment of diabetes and atherosclerosis.
• Gradual increase of fiber is advised to prevent abdominal discomfort and gas formation.
• Fluid intake must be no less that 8 glasses daily (about 1800-1900ml); to accommodate increased fiber intake.
Modify the normal diet to include:

- At least 4 servings of whole grain cereals.
- 2-3 servings raw fruit high in fiber such as apple or pear with skin.
- 2-3 servings raw or cooked vegetables high in fiber such as baked beans, cabbage, carrots, baked potatoes with skin.
- 1-2 tablespoons bran.

**Low fiber, low residue diet**

- Contain 5-10 g of fiber a day.
- Used in cases of diarrhea, diverticulitis, ulcerative colitis, intestinal blockage, and in preparation for intestinal surgery or immediately after.
- Some foods that do not actually leave residue are considered “high-residue” because they increase stool volume (milk) or have a laxative effect (prune juice).

How can you reduce the fiber content of the diet?

- Select only young tender vegetables.
- Omit those foods that have seeds though skins or much structural fiber (berries, celery, corn, cabbage).
- Peel fruits and vegetables such as apples, potatoes, and cucumbers.
- Cook foods to soften the fiber; or blend foods in blender.
- Using refined cereals, pasta and bread instead of whole grain products.
- Omit fruits and vegetables entirely and use strain juices.
MNT for the accessory organs

The Liver
The liver is of major importance to metabolic functions of the body; it performs more than 500 tasks. It is involved in the metabolism of carbohydrates, proteins, and fats; storage and activation of vitamins and minerals; formation and excretion of bile; and conversion of ammonia to urea.

Hepatitis
- It is an inflammation of the liver caused by viruses, drugs, and alcohol.
- Necrosis occurs and the liver’s normal metabolic activities are constructed.
- Hepatitis may be acute or chronic.
- Hepatitis A virus (HAV) is contracted through contaminated drinking water, food, and sewage via a fecal-oral route.
- Hepatitis B virus (HBV) and hepatitis C virus (HCV) are transmitted through blood, blood products, semen, and saliva. Can lead to chronic active hepatitis which must be confirmed by liver biopsy.
- In mild cases hepatocytes can regenerate and cells can be replaced.
- In severe cases chronic active hepatitis can cause severe necrosis and cirrhosis which can lead to liver failure and end stage liver disease and death.
- Hepatitis can cause bile stasis and decreased blood albumin levels.
- Patients experience anorexia, nausea, vomiting, fatigue, jaundice, abdominal pain, weight loss, headache, fever, and enlarged liver.
**Therapy**

- The goal is to regenerate affected tissue and prevent further damage.
- Bed rest with plenty of fluids is recommended.
- Small frequent meals (5-6 meals) are better tolerated by patients.
- Diet should provide 35-40 kcal / kg; mostly from carbohydrates.
- Liberal intake of CHO to increase the caloric intake and ensure synthesis of glycogen.
- Moderate amount of fat is given or normal if tolerated.
- If necrosis is not severe, 70-80 g protein is given for cell regeneration; but if necrosis is severe then proteins should be limited to 35-40 g to prevent accumulation of ammonia in the blood.
- Patients require encouragement to eat because of the anorexia and general malaise accompanying this disease.
- Recovery takes patience, rest, and time.

**Cirrhosis**

- Is a chronic disease with loss of liver cells, fatty infiltration, and fibrosis.
- Alcohol abuse is the most common cause of cirrhosis.
- Symptoms begin with anorexia, nausea and vomiting, followed by jaundice.
- Anemia, prolonged bleeding time and decreased serum albumin is present.
- In severe damage, ascites and hepatic failure are dangerous complications.

**Therapy**

- Small frequent meals (5-6 meals) are better tolerated by patients.
- Diet should provide 25-35 kcal / kg or more.
• 50-60% of kcal should be from carbohydrates.
• Restrict fat if not tolerated.
• Low protein diet to prevent hepatic failure (35-40 g/day).
• Vitamin and mineral supplements are usually needed.
• When ascites is present, the diet must be restricted in sodium to about 300-500 mg daily.
• If there is esophageal varices or bleeding, fiber restricted diet is used to prevent irritation of the tissue.
• Alcohol is not allowed.

**Hepatic Failure**

• Results from a decreased number of functioning liver cells and diminished delivery of nutrients.
• Ascites, edema, jaundice, central nervous system dysfunction, and decreased immune response are symptoms.
• The liver loses the ability to convert ammonia to urea, the ammonia is toxic to the nervous system.
• The breakdown of aromatic amino acids (phenylalanine, tyrosine, and tryptophan) is reduced and they accumulate in the blood.
• The branch chain amino acids (leucine, isoleucine, and valine) are broken-down in the peripheral muscle for energy and their blood level decrease.

**Therapy**

• The basic dietary principle is to decrease protein to minimize ammonia production.
• A protein free to low protein diet, 20-30g, is followed. Increase the protein intake 10-g protein every few days.
• Branch chain amino intake improves the amino acid profile.
• Include 1500-2000 kcal from carbohydrate and fat to prevent tissue breakdown.

The gallbladder
• The gallbladder concentrates and stores bile formed in the liver.
• Fat in the duodenum triggers the gallbladder to contract and release bile into the common duct for digestion of fat in the small intestine.
• Risk factor for gallbladder disease is female gender, pregnancy, older age, and obesity.
• Cholelithiasis is the presence of gallstones in the common bile duct causing obstruction and pain.
• Cholecystitis is the inflammation of the gallbladder. Usually cased by gallstones obstructing the bile duct.

Therapy
• Surgical removal of gallbladder (cholecystectomy) is used for cholecystitis and for cholelithiasis especially if there are many stones or if they are large.
• Medication to dissolve stones can be given in cholelithiasis.
• Fat intake maybe limited to 50-60 g/day since dietary fat causes the gallbladder to contract.
• During acute attacks of cholecystitis, the patient receives no food at first, then clear liquid, followed by fat restricted diet limiting fat intake to 40-45g daily.
• After cholecystectomy, a low fat diet is usually followed for few weeks and progress to normal diet.
The Pancreas

- Pancreatic cells manufacture insulin and secrete other hormones and enzymes important for the digestion of protein, fat, and carbohydrates.
- When food reaches the duodenum the pancreas sends its enzymes to aid in digestion in the small intestine (protein and hydrochloric acid simulates the pancreatic secretions).

Pancreatitis

- Is an inflammation of the pancreas.
- Symptoms include abdominal pain, nausea, vomiting, abdominal distention, and steatorrhea.
- Caused by alcoholism, biliary tract disease, gallstones, infections, surgery, or certain drugs.
- Acute pancreatitis: gallstones are the most common cause of acute pancreatitis; they cause a blockage of the flow of pancreatic juice which causes inflammation.
- Chronic pancreatitis: alcohol is the leading cause of chronic pancreatitis.

Therapy

- Intended to reduce pancreatic secretions and bile (pancreatic duct merges with the common bile duct and use the same opening into the duodenum).
- In acute pancreatitis nothing is given by mouth, but fluids and electrolyte are replaced parentally.
- When tolerated a liquid diet consisting mainly of carbohydrates is given, because carbohydrates have the least stimulatory effect on the pancreas.
• At later stages, a diet with normal amounts of carbohydrates and protein but limited in fat and fiber is given.
• Small frequent meals are better tolerated.
• Medium chain triglycerides are sometimes used to increase the caloric intake.
• Vitamin and mineral supplements may be given.
• Alcohol is forbidden.
Nutritional Care in Diabetes Mellitus

Classification of diabetes

1. Type 1 DM (Immune mediated diabetes).
2. Type 2 DM (accounts for 90–95% of those with diabetes-adult onset diabetes).
3. Impaired glucose tolerance (IGT): plasma glucose levels higher than normal (usually reaches 5.6 mmol/l) but lower than established diagnostic standards for diabetes (3.9-6.1 mmol/l).

<table>
<thead>
<tr>
<th></th>
<th>Type 1 DM</th>
<th>T2 DM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of onset</td>
<td>Usually before 20 years</td>
<td>After 20 years</td>
</tr>
<tr>
<td>Body weight</td>
<td>Normal</td>
<td>Usually increased</td>
</tr>
<tr>
<td>Etiological factors</td>
<td>Genetics, Viruses, Immunological factors</td>
<td>Genetics, Environmental factors</td>
</tr>
<tr>
<td>Role of genetics</td>
<td>Small</td>
<td>Significant</td>
</tr>
<tr>
<td>β-Cells</td>
<td>Markedly decreased</td>
<td>Normal to slightly decreased</td>
</tr>
<tr>
<td>Insulin level</td>
<td>Absent or low</td>
<td>High</td>
</tr>
</tbody>
</table>

Symptoms of DM

1. Polydipsia: excessive thirst
2. Polyphagia: excessive hunger
3. Polyuria: excessive urination
4. Weight loss, fatigue, and ketoacidosis

Diagnosis

1. A fasting (no caloric intake for at least 8 hours) plasma glucose level of 7 mmol/l or higher on 2 occasions is diagnostic of diabetes.
mmol/l = .0555 x mg/dl
Or mmol/l = mg/dl ÷ 18.02

2. Oral Glucose Tolerance Test (OGTT) may be ordered to confirm the diagnosis. 2-h postload glucose 11.1 mmol/l during an OGTT. The test should be performed as described by WHO, using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water.

Monitoring control
A. Blood measurements
   1. SBGM or HBGM (for monitoring short term diabetic control)
      • Using glucometers
      • 3 - 4 times or more per day

2. Glycosylated hemoglobin
   • Hemoglobin to which glucose is attached to.
   • Reflect the glucose level in the previous 3 months
   • Normal 6%, poorly controlled diabetes 10%

B. Urine measurements
   1. Urine glucose: if blood glucose rises above renal threshold (180 mg/dl) glucose will be excreted in the urine. Results expressed on the plus system
   2. Urine ketones: diabetics should test for the presence of urine ketones during infections or other illness.

Complications of Diabetes
A. Acute complications
   1. DKA
2. Hypoglycemia
3. Acute hyperglycemia

B. Chronic complications
1. Neuropathy and nerve damage
2. Retinopathy
3. Nephropathy

Treatment of diabetes
A. Non pharmacological therapy

Medical Nutrition Therapy (MNT)
Aims to improve the metabolic control of the individuals through:
• Individuals with prediabetes or diabetes should receive individualized MNT, preferably administered by a registered dietitian knowledgeable about the components of diabetes MNT.

• Nutrition counseling should be tailored to the personal needs of the individual with prediabetes or diabetes and his or her willingness and ability to make changes.

• Modest weight loss in overweight and obese insulin-resistant individuals has been shown to improve insulin resistance and is therefore recommended for all such individuals who have or are at risk for diabetes.

• In the short-term (up to 1 year), either low-carbohydrate or low-fat, energy-restricted diets may be effective for weight loss.

• Patients receiving low-carbohydrate diets should undergo monitoring of lipid profiles, renal function, and protein intake (in patients with nephropathy), and have adjustment of hypoglycemic therapy as needed.

• Physical activity and behavior modification aid in weight loss and are most helpful in maintaining weight loss.

• When combined with lifestyle modification, weight loss medications may help achieve a 5% to 10% weight loss and may be considered for overweight and obese individuals with type 2 diabetes.

• For some patients with type 2 diabetes and a body mass index of 35 kg/m^2 or more, bariatric surgery can markedly improve glycemia.

• Primary prevention for individuals at high risk of developing type 2 diabetes should include structured programs targeting lifestyle changes, with dietary strategies of decreasing energy and dietary fat intakes. Goals should include moderate weight loss (7% body weight), regular physical activity (150 minutes/week), dietary fiber
intake of 14 g/1000 kcal, and whole grains comprising half of total grain intake.

- Intake of low glycemic index foods that are rich in fiber and other vital nutrients should be encouraged, both for the general population and for those with diabetes.
- Secondary prevention, or controlling diabetes, should include a healthy dietary pattern emphasizing carbohydrate from fruits, vegetables, whole grains, legumes, and low-fat milk.
- A key strategy for achieving glycemic control is to monitor carbohydrate by counting, exchanges, or experienced-based estimation. Use of glycemic index and load may be modestly beneficial vs considering only total carbohydrate.
- Sucrose-containing foods should be limited but can be substituted for other carbohydrates or covered with insulin or other glucose-lowering medications. Glucose alcohols and nonnutritive sweeteners are safe within daily US Food and Drug Administration intake levels.
- Saturated fat should be limited to less than 7% of total energy, and trans fat should be minimized. In individuals with diabetes, dietary cholesterol should not exceed 200 mg/day.
- At least 2 servings of fish per week (except for commercially fried fish) are recommended for n-3 polyunsaturated fatty acids.
- Protein should not be used to treat acute or prevent nighttime hypoglycemia. High-protein diets are not recommended for weight loss.

**Exercise**

- Results in greater sensitivity to insulin and thus lowers blood glucose levels and increases glucose tolerance.
• Decreases hypercholestrolemia, hypertriglyceridemia, high HbA1c, excess LDL, and hypertension.
• Should be under medical supervision to decrease the risk of hypoglycemia.
• Affect the rate of absorption of insulin therefore it should not be injected directly to the muscles to be exercised.
• Diabetic patients should always carry a source of carbohydrate to counteract potential hypoglycemia. A common recommendation is to eat a snack with 10-15 g carbohydrate before the exercise.

Behavior modification
• Are similar to those suggested for treatment of obesity.
• Is very important for monitoring short-term diabetic control.
• Patient should reduces the intake of fast foods and learn skills in refusing food offers.

SMBG
Studies suggested that diabetic patient who had a blood glucose level close to normal had 50 to 75 percent reduction in chronic complication of diabetes

B. Pharmacological therapy
1. Insulin
• Must be taken by injection because it would be digested if it is taken orally.
• Insulin needs are divided into two parts
  1. Basal insulin requirement is the amount needed to control blood glucose between the meals.
2. Dietary insulin requirements are the additional amounts needed before each meal or during exercise

- Insulin dose depend on their speed of onset, time to peak action, and duration action.

![Types of insulin — onset and duration of action](image)

**2. Oral Hypoglycemic (OHA)**

Are used in T2 DM when diet and exercise are not affective.

**Diabetes and pregnancy:**

- Pregnant diabetics are classified into two groups
  1. The diabetic women who become pregnant
  2. The pregnant with diabetes
- T2 DM pregnant will usually require insulin during pregnancy
- An evening snack containing a minimum of 25-g CHO should be included to avoid hypoglycemia during the night.
- Pregnancy is not the time for weight correction, however excessive weight gain should be avoided.
- Gestational diabetics require extensive instruction because they have not had previous instruction.
### Calculating a Meal Pattern

<table>
<thead>
<tr>
<th></th>
<th># of Exchanges</th>
<th>Carbohydrates (g)</th>
<th>Protein (g)</th>
<th>Fat (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Milk</em> - Skim, LF, Whole</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetable</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bread/Starch</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Meat</em> - Lean, Medium, High fat</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fat</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Circle the one used in calculating the meal pattern

### Distribution of exchanges at meals & snacks

<table>
<thead>
<tr>
<th>Exchange</th>
<th>Total # of exchanges</th>
<th>Breakfast</th>
<th>AM snack</th>
<th>Lunch</th>
<th>PM Snack</th>
<th>Diner</th>
<th>BT Snack</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bread</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meat</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fat</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Nutrition in Atherosclerosis, hyperlipidemias, hyperlipoproteinemia, diseases of the heart & Hypertension

There are four major risk factors in coronary heart disease (CHD)

1. Hyperlipidemia & hypertriglyceridemia
2. Hypertension
3. Smoking
4. Obesity

The presence of one of these doubles the risk for CHD

Blood Lipids
- Measurement of blood lipids is useful for diagnosis and therapy of the CHD
- Since cholesterol is transported in LDL, increased level of LDL is associated with increased risk of CHD
- Prevention of Atherosclerosis:

1. Since obesity is a major risk factor in CHD, a caloric intake that will lead to attaining and maintaining reasonable weight is suggested.
2. A diet with fat intake < 30% of total energy intake is recommended with saturated and polyunsaturated fat each making up one third of this total.
3. A cholesterol intake of 300 or less is suggested
4. CHO should provide 50-60% of the total caloric intake
5. Increase the consumption of soluble fibers
**Fat modified diets**

Three-phase diet (American Heart Association): Dietary changes are phased in gradually to improve compliance.

**Phase 1**: preventive. Designed for people with increased total or LDL cholesterol, family history of hyperlipidemia or other coronary heart disease risk factors

**Phase 2**: for those with total cholesterol at or above 250 mg/dl or for people who does not respond to phase 1

**Phase 3**: for persons with total cholesterol at or in excess of 275 mg/dl or a family history of premature CHD.

<table>
<thead>
<tr>
<th>Three-Phase diet (American Heart Association)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Phase</strong></td>
</tr>
<tr>
<td>Fat, % Kcal</td>
</tr>
<tr>
<td>S. fat,%</td>
</tr>
<tr>
<td>PUFA, %</td>
</tr>
<tr>
<td>MUFA, %</td>
</tr>
<tr>
<td>Cholesterol, mg</td>
</tr>
<tr>
<td>CHO, % Kcal</td>
</tr>
<tr>
<td>Protein, %</td>
</tr>
<tr>
<td>Kcal</td>
</tr>
</tbody>
</table>

**Two step diet (National Cholesterol Education Program)**: to lower serum lipid

**Step 1**: for people with total blood cholesterol levels between 5.2-6.2 mmol/l

**Step 2**: planned for persons with total blood cholesterol in excess of 6.2 mmol/l the diet is suitable also for moderate elevation of blood cholesterol with risk factor, and people who does not respond to step 1
diet. If this step fails to lower blood cholesterol in 6 months the diet is continued and drug therapy begins.

Two–Step Diet (National Cholesterol Education Program)

<table>
<thead>
<tr>
<th>Phase</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fat, % Kcal</td>
<td>&lt;30</td>
<td>&lt;30</td>
</tr>
<tr>
<td>S. fat, %</td>
<td>&lt;10</td>
<td>&lt;7</td>
</tr>
<tr>
<td>PUFA, %</td>
<td>Up to 10</td>
<td>Up to 10</td>
</tr>
<tr>
<td>MUFA, %</td>
<td>10-15</td>
<td>10-15</td>
</tr>
<tr>
<td>Cholesterol, mg</td>
<td>&lt;300</td>
<td>&lt;200</td>
</tr>
<tr>
<td>CHO, % Kcal</td>
<td>50-60</td>
<td>50-60</td>
</tr>
<tr>
<td>Protein, % Kcal</td>
<td>10-20</td>
<td>10-20</td>
</tr>
</tbody>
</table>

Diets for lipoproteinaemia:
Lipoproteinaemia is classified into six phenotypes

<table>
<thead>
<tr>
<th>Type</th>
<th>Lipoproteins increased</th>
<th>Lipids increased</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Chylomicrons</td>
<td>Triglycerides</td>
</tr>
<tr>
<td>IIa</td>
<td>LDL</td>
<td>Cholesterol</td>
</tr>
<tr>
<td>IIb</td>
<td>LDL and VLDL</td>
<td>Cholesterol and triglycerides</td>
</tr>
<tr>
<td>III</td>
<td>Beta-VLDL (= IDL + chylomicron remnants)</td>
<td>Cholesterol and triglycerides</td>
</tr>
<tr>
<td>IV</td>
<td>VLDL</td>
<td>Triglycerides</td>
</tr>
<tr>
<td>V</td>
<td>Chylomicrons and VLDL</td>
<td>Cholesterol and triglycerides</td>
</tr>
</tbody>
</table>

Meal planning
- Select low fat (or skim) milk and meat exchange.
- Select fat from monounsaturated and polyunsaturated content.
- All visible fat must be removed from the meat.
• If the meat is broiled they should be placed on a rack.
• Behavior modification.

### Effect of Dietary Changes on Serum Lipids

<table>
<thead>
<tr>
<th>Effect</th>
<th>Cholesterol</th>
<th>LDL, VLDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>↓</td>
<td>↓</td>
<td>↓</td>
</tr>
<tr>
<td>T.Fat</td>
<td>↓ LDL</td>
<td></td>
</tr>
<tr>
<td>S.Fat</td>
<td>↓ LDL</td>
<td></td>
</tr>
<tr>
<td>Sugar</td>
<td>↓ VLDL</td>
<td></td>
</tr>
<tr>
<td>Calories</td>
<td>↓ LDL, VLDL</td>
<td></td>
</tr>
</tbody>
</table>

### Diseases of the heart

1. **Myocardial Infarction**

#### Acute phase

- For the first 24-28 hour after heart attack the patient is given nothing by mouth.
- A low-fat liquid diet supplying 500-800 kcal is then given. Examples of low-fat liquid diet are broth, fruit juice, skim milk, decaffeinated coffee, and tea.
- Foods should be at room temperature to prevent arrhythmias.
- Caffeine is excluded because of its stimulating effect.
- A soft diet is then started
  - 1000-1200 kcal
  - 5-6 easily digested meals
  - Cholesterol restricted to < 300 mg
  - Low in saturated fat with increased proportion of polyunsaturated fatty acids.
  - Mild Na restriction (2000 mg) to prevent excess fluid retention.
- Avoid foods that produce gas.
- Fluid restriction if edema is present

Rehabilitative phase
The diet should be low in saturated fat & cholesterol.

2. Congestive heart failure
- Is the inability of the heart to maintain adequate circulation to the tissues
  - low circulation → low secretion of Na by the kidney → Na in extracellular fluid → retention of water → edema
  - Low circulation → low blood supply to the GI tract → slow digestion → anorexia and some times vomiting.

Diet
- The aim is to decrease the workload of the heart
- Is similar to that used in myocardial infarction
- In addition Na is restricted to 500-700 mg

3. Hypertension
- Is a major risk factor for congestive heart failure, coronary heart disease, renal disease, and stroke.
- Normal blood pressure is less than 140 mm Hg systolic (when heart is contracting) and less than 85 mm diastolic (when heart is expanding).
- Primary hypertension is of unknown etiology but obesity, family history of hypertension, excessive salt consumption, physical
inactivity, and alcohol consumption all represent a risk for hypertension.

**Therapy**

1. Non pharmacological
   - weight control
   - moderate Na restriction
   - regular exercise
   - stress management

2. Pharmacological therapy
   - For people with high diastolic pressure and people who are at high risk because of diabetes or CHO
   - Thiazide diuretics, loop diuretics, potassium-sparing diuretics, and beta blockers are used for treatment of hypertension.

**Sodium restricted diet**

- Sodium-restricted diets contain a specified amount of sodium that ranges from mild to extreme restriction.

- Levels of Na restriction commonly prescribed are
  1. 200 –300 mg (9-13mEq; 1mEq Na= 23mg): Is called extreme restriction: no salt in cooking, low Na milk, low Na foods and is used in cirrhoses of the liver with ascites, the level is used only for hospital patients.

  2. 500-700 mg (22-30 mEq) Is called sever restriction: no salt is added in cooking, regular milk, foods in measured amounts. Used for congestive heart failure, cirrhosis with ascites, and end
stage renal disease with edema for patient not on dialysis. Intended for hospital patients.

3. 1000-1500 mg (45-65 mgEq): Is called moderate restriction: no salt is added in cooking, regular milk; salted bread and butter may be used. Salty foods are omitted. Used in borderline hypertension or as maintenance diet at home.

4. 2000-3000 mg (87-130 mEq): is called mild restriction: small measured amounts of salt in cooking, no salt at the table, no salty foods. Used as maintenance diet for cardiac and renal disease.

**Sources of Na**

- The principle source of Na in the diet is salt (at table, in cooking, in food processing)
- Naturally occurring Na
  - animal source high in Na
  - Plant source lower in Na (some exceptions)
  - Egg is high in Na (egg white)
  - Spinach, chard, kale are high in salt
  - Fruits, unsalted cereals, unsalted bread, and unsalted butter, oils and sugars are low in Na, or none at all and may be used without restriction.
- Na containing compounds are baking powder, baking soda, sodium chloride, sodium sulfite, and sodium citrate.
**DASH diet** (stands for Dietary Approaches to Stop Hypertension): In studies, patients who were on the DASH diet reduced their blood pressure within two weeks.

The main objective of the diet is to lower high blood pressure; therefore it should be incorporated into the lifestyle through:

- Eating more fruits, vegetables, and low-fat dairy foods
- Cutting back on foods that are high in saturated fat, cholesterol, and total fat
- Eating more whole grain products, fish, poultry, and nuts
- Eating less red meat and sweets
- Eating foods that are rich in magnesium, potassium, and calcium

The following is a list of food groups and suggested serving amounts for the DASH diet:

- **Grains:** 7-8 daily servings
- **Vegetables:** 4-5 daily servings
- **Fruits:** 4-5 daily servings
- **Low-fat or fat-free dairy products:** 2-3 daily servings
- **Meat, poultry and fish:** 2 or less daily servings
- **Nuts, seeds, and dry beans:** 4-5 servings per week
- **Fats and oils:** 2-3 daily servings
- **Sweets:** try to limit to less than 5 servings per week
Nutrition considerations in the diseases of the kidney

Functions of the Kidney

Maintain normal composition and volume of the blood and other body fluids through:

1. Excretion of metabolic waste such as urea, uric acid, creatinin, ammonia, toxic substances and drugs.
2. Regulation of fluid balance: ADH and aldosterone affect the amount of the Na the kidney absorb or excrete. Rennin influences the production of aldosterone.
3. Regulation of electrolyte balance: balancing Na and K
4. Help in the regulation of acid-base balance: along with the lungs, the kidneys are the main regulatory system of blood PH.
5. Help in the regulation of blood pressure: through the excretion and the absorption of Na and water by the rennin-angiotensin system.
6. Influence the production of blood cells: erythropoietin, a hormone produced by the kidney, stimulates the bone marrow to produce RBC's and influence their maturation.
7. Conversion of calcidiol to calcitriol, which is the active vitamin D 3 hormone, which in turn mediate the absorption of calcium and phosphorus from the GI tract.

Types of Renal Disorders

1. Nephritis is a general term referring to inflammation of the kidneys.
2. Nephrosclerosis is the hardening of renal caused by arteriosclerosis and hypertension.
3. Polycystic Kidney Disease (PKD) is a hereditary kidney disease in which many cysts grow in the kidneys. These cysts may lead to kidney failure.
4. **Nephrolithiases** is a condition in which stones develop in the kidneys. Some are asymptomatic and some have symptoms including hematuria, infection, obstruction, and intense pain.

5. **Glomerulonephritis** is a nephritis affecting the capillary loops of the glomeruli.

6. **Nepholetic Syndrome** is a disorder where the kidneys have been damaged casing a change in the glomerular capillaries causing them to leak protein from the blood into the urine.

7. **Acute Renal Failure** Sudden kidney failure caused by blood loss, drugs or poisons. If the kidneys are not seriously damaged, acute renal failure may be reversed.

8. **Chronic Renal Failure** Gradual loss of kidney function also known as Chronic Renal Disease.

9. **End-Stage Renal Disease** The condition of total or nearly total and permanent kidney failure.

**Acute glomerulonephritis:**
- The condition usually follows a streptococcal infection of the respiratory tract but mild infection is asymptotic.
- Symptoms if present are nausea, vomiting, fever, hypertension, hematuria, and oliguria (literally, little urine. This is usually defined as a 24-hour urine volume of less than 400 to 500 ml)
- Usually resolve on their own or advance to nephrotic syndrome or ESRD.

**Dietary consideration:**
1. During acute stage non-protein liquids such as sweetened fruit juice, tea, fruit ices, and high carbohydrate, low electrolyte supplements are given to help reduce tissue breakdown.
2. Fluid intake is restricted in proportion of urine output.
3. Protein restricted to 40g of high BV in uremia (urea in the blood).
4. Sodium restricted to 500-1000 mg in hypertension.
5. Potassium restricted to 1500-2500 mg in hyperkalemia.

**Nephrotic syndrome**
- Alterations of the glomerular basement membrane allows persistent loss of large amounts of protein in the urine.
- It is characterized by albuminuria (>3 g/day) hypoalbuminemia, edema, hyperlipidemia (unclear cause), and oliguria. And is usually associated with diabetes and glomerulonephritis

**Dietary consideration**
1. Protein 0.8 to 1 g/kg IBW 80% HBV.
2. Na is restricted if edema present.
3. Potassium and other minerals (calcium, phosphorus) monitored and individualized.
4. Fluid unrestricted

**Acute renal failure**
- Decrease in the glomerular filtration rate (GFR), therefore increase in the serum urea, and serum creatinin.
- Symptoms are uremia, oliguria, or anuria (literally, absence of urine. This is usually defined as a 24-hour urine volume of less than 100 ml), patient may be drowsy, weak, tired, or have headache.

**Dietary consideration**
1. Fluid is restricted to urine output plus 500 ml to allow for insensible water loss.
2. As the glomerular filtration rate increase, a protein allowance of 20-40g is permitted.

3. Energy intake should be sufficient to prevent catabolism.

4. Dietary intake should be adjusted based on the serum electrolyte levels.

5. In the recovery phase a high protein, high calorie diet is required.

**Chronic renal failure**

Decline in the glomerular filtration rate proceeds toward end stage renal disease.

Dietary consideration:

1. Energy: 2000-3000 kcal daily to prevent tissue breakdown. A high carbohydrate low protein low electrolyte supplements and beverages and desserts are used to increase total calories.

2. Protein: is restricted to 0.6 g/kg for patients who are not on dialysis (intake of 60 g is common).

3. Potassium: since hyperkalemia is common, 1500-2500 mg potassium restricted diet is prescribed.

4. Sodium: restriction ranges from 500-2000 mg are necessary if edema and hypertension present. Sodium intake depends on blood and urine levels.

5. Phosphorus: dietary phosphorus is restricted to 600-1200 mg/day.

6. Other minerals and vitamins: supplements of Ca, Fe, and vitamin B complex are recommended because of the restriction.

7. Fluids: if oliguria present, fluids are restricted to daily urine volume plus 500 ml for insensible losses.