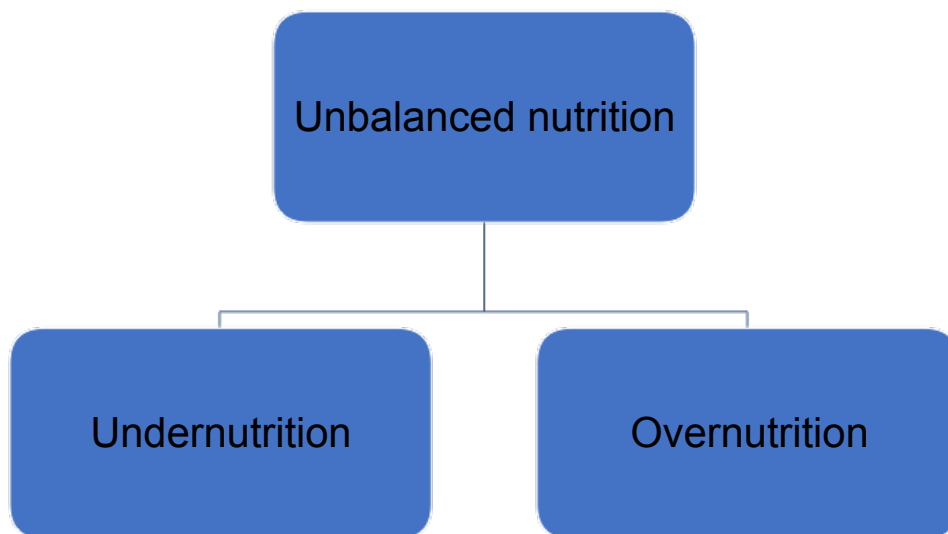


NUTD 331: CLINICAL NUTRITION 1

INSTRUCTOR: Hind Eliyan

What is Malnutrition



Undernutrition

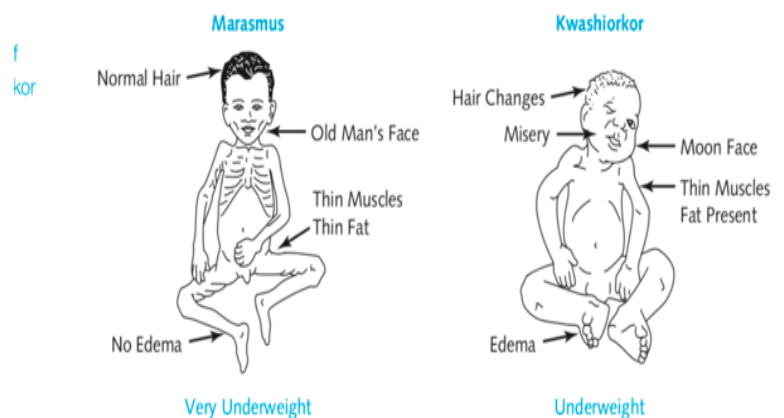
- Caused by a lack of calories, protein or other nutrients
- Usually seen in areas of the world with inadequate supply of food and drinking water
- **Protein-energy malnutrition** - resulting from deficiencies in any or all nutrients (macro and micro)
 - Wasting (low weight for height)
 - Stunting (Low height for Age)
 - Underweight (low weight for age)
- **Micronutrient deficiencies or insufficiencies** (a lack of important vitamins and minerals)

World Health Organization, *Malnutrition*.

According to the WHO

Protein Energy Malnutrition

- The most widespread form of malnutrition in the world today.
- PEM includes
- **kwashiorkor** (a protein-deficiency disease)
- **Marasmus**- A deficiency disease caused by inadequate food intake



Community Nutrition in Action - Marie A. Boyle

Malnutrition- Undernutrition

Chronic Malnutrition usually results in **Stunting** - Inadequate nutrition over long period of time leading to failure of linear growth

“Stunting is often associated with cognitive impairments such as delayed motor development, impaired brain function and poor school performance”

Acute Malnutrition usually results in **wasting** (Too thin for height)

” Rapid deterioration in nutritional status over a short period of time”

- Acute malnutrition
- Moderate acute malnutrition (MAM)
- Severe acute malnutrition (SAM).

2020 Global Nutrition Report
<https://globalnutritionreport.org/454aeb#0718a918-stunting-in-children-under-five>



Children who are underweight can experience stunting, wasting or both

Short to medium term consequences of undernutrition



45% of all child deaths is from poor nutrition

Poor nutrition in the 1,000 days from conception of a child to 2 years of age results in permanent damage

Mawuli Sablah, *Causes and Impacts of Undernutrition over the Life Course*, UNICEF, New York, Sept 2019

Micronutrient deficiencies

Lack of intake, absorption or use of one or more vitamins or minerals

Micronutrients that remain issues globally

Iron

- Iron-deficiency anemia is estimated to affect some 1.6 billion people. Iron deficiency in infancy and early childhood is associated with decreased cognitive abilities and resistance to disease
- Iron deficiency in infancy and babies causes impaired developmental growth and severe iron deficiency kills about 50,000 young women a year in pregnancy and childbirth

Zinc

- Zinc deficiency contributes to growth failure and weakened immunity in young children
- Results in some 800,000 child deaths per year
- Zinc deficiency is typically the result of inadequate dietary intake, as children in the developing world have mainly plant-based diets, which are often low in zinc

Holben, B., 2012. *Community nutrition in action: Entrepreneurial approach*. Chicago.

Vitamin A

- About 140 Million children experience vitamin A deficiency
- Thousands suffer from **partial blindness** as a result
- **Compromise immune system and leads to early deaths among children**

Folate

- Folate deficiency increases the risk of neural tube defects
- Anemia

Vitamin B12

- Anemia
- cognitive damage (in severe B12 def)

Iodine

The major preventable cause of mental retardation

Holben, B., 2012. Community nutrition in action: Entrepreneurial appr, Cengage.

Causes mental and physical retardation

Malnutrition in Adults

Moderate and severe thinness or underweight in adults

BMI < 18.5 underweight

BMI < 17.0 Moderate and severe thinness

BMI < 16.0 risk for ill health and even death

Besides **inadequate access to food and water, malnutrition can be the result of an eating disorder, organ failure, severe infections , physical trauma or chronic diseases**

Malnutrition/ Older Adults

- ① • Among the adult population, malnutrition can occur especially in those with dementia or Alzheimer's disease.
- ② • Adults with Disorders of the gastrointestinal system (malabsorption of nutrients) – drugs can interact with absorption of nutrients
- ③ • Tooth loss and other dental issues, loss of appetite can also lead to malnutrition among the elderly
- ④ • Chronic illness: diabetes
- ⑤ • Depression
- ⑥ • Socioeconomic status

Evans, C., 2005. Malnutrition in the elderly: A multifactorial failure to thrive. *The Permanente Journal*, 9(3).

Clinical Malnutrition

When a hospital patient becomes malnourished

- If patient is recovering/healing: Body requires more nutrition than usual
- Patient may not be absorbing the nutrients they eat. In this case nutrition through a tube inserted into their stomach (through GI tract)
- Intravenous nutrition, where the digestive tract is bypassed altogether (Parenteral nutrition)
- Malnutrition is frequently reported in patients hospitalized with an acute illness.
- Malnutrition weakens the immune system
- Surgical patients with malnutrition are much more likely to suffer from major and minor complication/ influence response to treatment

Indicators used to Measure Nutritional Status

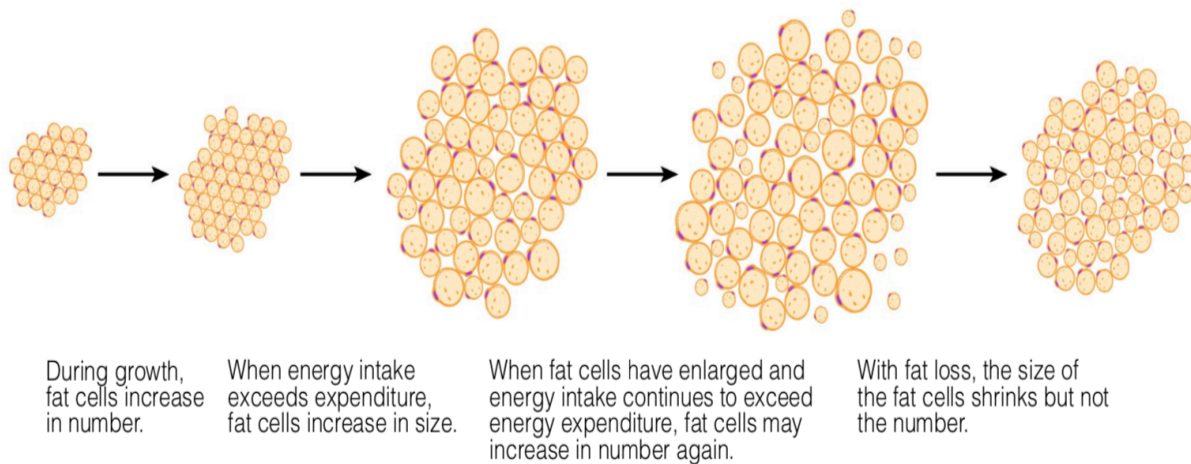


Malnutrition- Obesity

- Excessive fat accumulation can impair health
- obesity develops when a person's fat cells increase in number or size, or commonly, **both**
- Prevention of obesity is most critical, then, during the growing years of childhood and adolescence, when fat cells increase in number

> FIGURE 9-2 Fat Cell Development

Fat cells are capable of increasing their size by 20-fold and their number by several thousandfold.

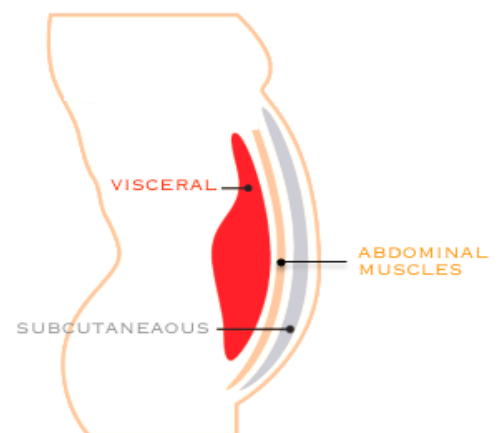


People with increased number of fat cells – more difficult to maintain weight loss because as they gain weight, their fat cells readily fill in

People with increased fat cell size may be more successful at maintaining weight loss

Obesity

- BMI
- Location of the type of obesity (**visceral vs subcutaneous**) may be more important than BMI itself



Subcutaneous fat around the **hips and thighs**, sometimes referred to as **lower-body fat**, is most common in women



Upper-body fat is more common in men than in women and may be more closely associated with chronic diseases.

SOURCE: P. E. C. Wildman and D. M. Medeiros, *Advanced Human*

Lower-body fat is more common in women than in men and is not usually associated with chronic diseases.

Visceral fat : stored around the organs of the abdomen is referred to as **central obesity** or upper-body fat

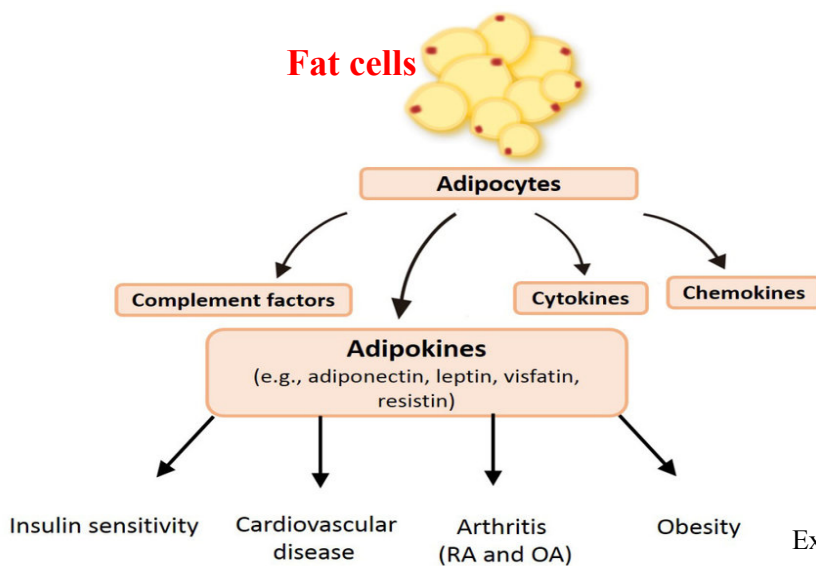
Visceral fat is thought to induce a number of metabolic changes that promote insulin resistance, which then leads to hyperglycemia and other abnormalities.

Obesity and Diet-related noncommunicable diseases

- Excess fat first fills the body's natural storage site—adipose tissue
- If fat is still abundant, the excess is deposited in organs such as the heart and liver and plays a key role in the development of diseases such as heart failure and fatty liver, and other CVDs

Adipose tissue (Not only a storage site but has **endocrine** function as well)

- Produces **adipokines** (a family of hormones that help regulate energy balance
- Adipokines have both
 - Inflammatory
 - Anti inflammatory activities
- The type and quantity of adipokine secretions change depending on the quantity of adipose tissue
- Dysregulated production or secretion of adipokines has been linked with obesity-linked complications
- Example: **Resistin**, an adipokine that promotes inflammation and insulin resistance—factors that predict heart disease and diabetes



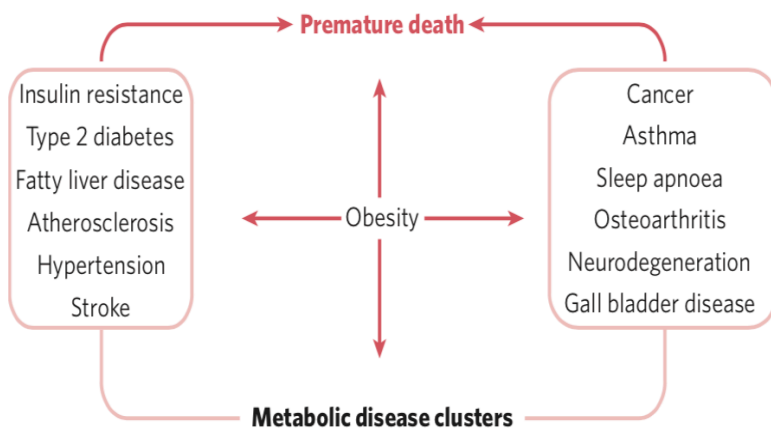
Cytokines

Small soluble proteins involved in cell signaling and communication among immune and non-immune cells.

chronic 'inflammation' characterized by abnormal cytokine production and other mediators,

Examples : (Tumor necrosis factor)TNF- α is a proinflammatory cytokine that activates various signal transduction cascades, including many of the pathways involved in the inhibitors of insulin action.

MacDonald et al. *International journal of molecular sciences*. 2019;20(6), 1505.

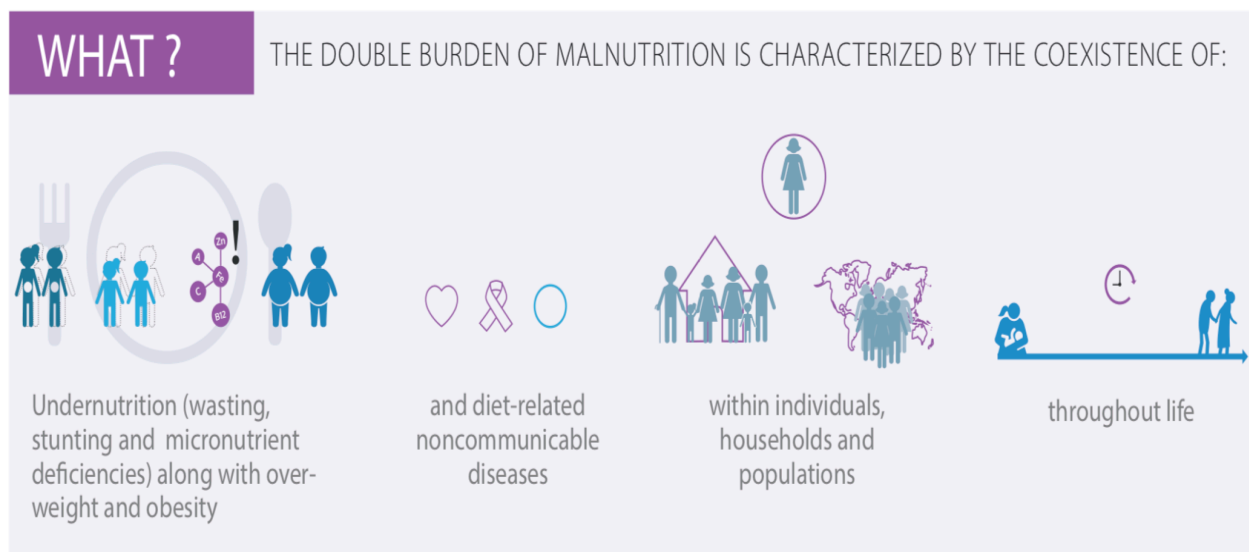


“Obesity is considered to be a central feature that increases the risk for a vast array of diseases”

Hotamisligil GS. Inflammation and metabolic disorders. *Nature*. 2006 Dec 14;444(7121):860-7.

DOUBLE BURDEN OF MALNUTRITION

Fig. 1. The double burden of malnutrition



World Health Organization. (2016). The double burden of malnutrition: policy brief. World Health Organization.

The double burden of malnutrition can manifest at three levels, the individual, household and population level

At the individual level simultaneous

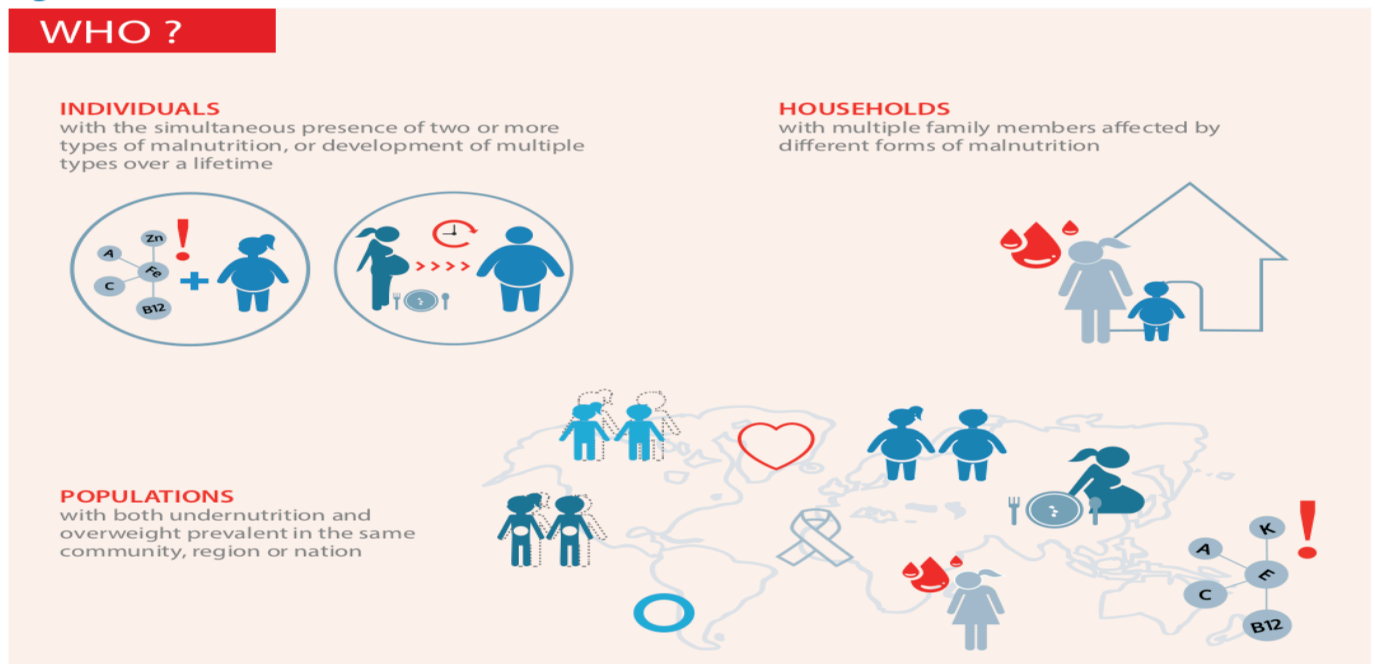
The development of two or more types of malnutrition

e.g. obesity with anemia or any vitamin or mineral deficiencies or insufficiencies.

Can be temporally separated- e.g. suffering from chronic under nutrition in childhood leading to stunting and becoming overweight in adulthood due to an economic shift in one's environment

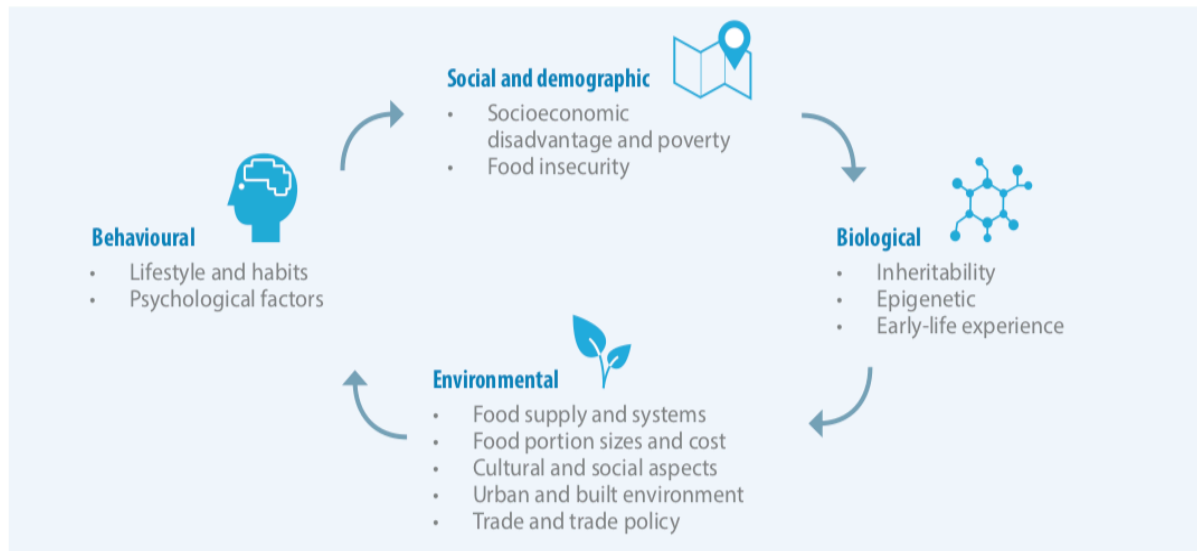
World Health Organization. (2016). The double burden of malnutrition: policy brief. World Health Organization.

Fig. 3. The double burden of nutrition can occur at three levels



World Health Organization. (2016). The double burden of malnutrition: policy brief. World Health Organization.

Fig. 4. Drivers of the double burden of malnutrition



World Health Organization. (2016). The double burden of malnutrition: policy brief. World Health Organization.

Some studies show that obesity prevalence is increasing rapidly in some regions of the world where micronutrient deficiencies are more prevalent.

Could the micronutrient deficiencies of individuals in these communities contributing to the increase in obesity rates?

Or could the obesity contribute to the manifestation of the micronutrient deficiencies

Some micronutrient concerns and obesity

- Vitamin D is highly prevalent among obese individuals
- One study suggests that vitamin D-deficient obese children improved their vitamin D status following weight loss- some fat soluble vitamins may deattach from adipose tissue and become less bioavailable
- Vitamin A and obesity
- Calcium and obesity

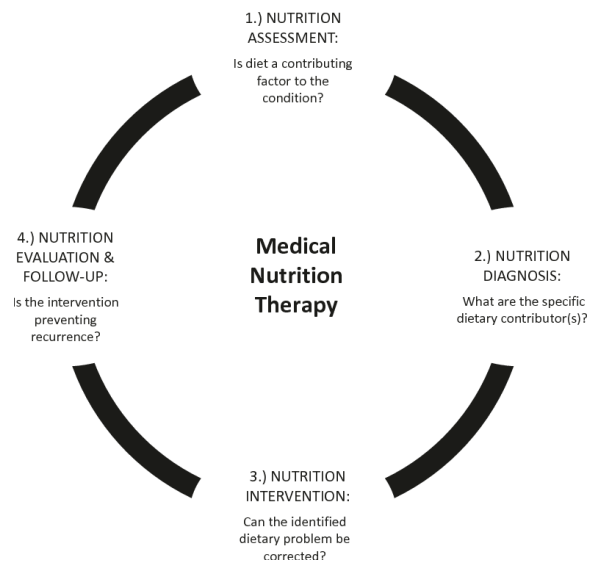
García et al. Impact of micronutrient deficiencies on obesity, *Nutrition Reviews*, 2014, 76(1), 1-12

“Growing evidence that vitamin and mineral deficiencies are

Medical Nutrition Therapy

The scope of Clinical Nutrition

Foods, metabolic responses, and behaviors which promote optimal health to prevent or manage disease conditions.



MNT

Medical Nutrition Therapy

The nutritional treatment necessary to manage or treat a condition, illness or injury

An evidence-based medical approach to treating certain chronic conditions through the use of an individually-tailored **nutrition plan**.



Nutrition services are one of the first treatments that individuals should receive to improve conditions such as diabetes, heart disease and hypertension.

- Registered dietitians work among the health professional team to treat patients

