

Nutrition and Health

KSU Dept of Family & Community Medicine

435 Lecture Notes by Qusay Ajlan

Original Content | **Titles** | Additional Notes | **Important**

Objectives

- To define nutrition and community nutrition
- To identify the functions of different nutrients and the conditions caused by their deficiency.
- To identify the components of a healthy diet.
- To differentiate between different types of malnutrition and their assessment
- To understand the double burden of malnutrition
- To identify risk factors and complications of different types of malnutrition

Definitions:

• Nutrition:

Is the process of consuming foods, digesting and absorbing nutrients and using these nutrients for growth, development, and maintenance of a healthy life.

-Basically, nutrition consists of diet (what you take in) and metabolism (what happens to it after it enters your body).

Community Nutrition:

- Examines the role of nutrition in the etiology of disease
- Monitors the nutritional status of populations.
- Identification of nutritional needs of population groups and available resources.
- Develops and evaluate interventions to achieve and maintain healthful eating patterns among populations.

Importance of community nutrition

- Nutrition is important for good health
- Nutrition is a human right
- Poor nutrition has adverse intergenerational effect
- Dietary factors are associated with some of leading causes of death
- Vulnerable subgroups are at high risk
- Behavior change is challenging
- Good nutrition is a building block to help countries meet many development goals: health, education, gender equality, and poverty alleviation

•Goal is to provide adequate nutrition to all.

- By health promotion and disease prevention, (therapeutic and rehabilitative services too)
- Needs multiple coordinated strategies to reach and influence the community and organizations.

Assessing eating behaviors

- Hunger
- Appetite
- Cultural and social meaning of food
- Habit or custom
- Emotional comfort
- Convenience and advertising

NUTRIENTS

- **Macronutrients:**

- Proteins

- Fats

- Carbohydrates

- **Micronutrients:**

- Vitamins

- Minerals

Macronutrients



carbs



proteins



fats

Carbohydrates

-Carbohydrate is the main source of energy

The carbohydrate reserve (glycogen) of a human adult is about 500g. This reserve is rapidly exhausted when a man is fasting. If the dietary carbohydrates do not meet the energy needs of the body, protein and glycerol from dietary and endogenous sources are used by the body to maintain glucose homeostasis.



Carbohydrates

Monosaccharide

Glucose
Fructose
Galactose



Single sugar molecule

Disaccharide

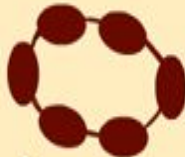
Maltose
Sucrose
Lactose



Two sugar molecules linked

Polysaccharide

Starch
Glycogen
Cellulose



Many sugar molecules linked

Factors maintaining blood glucose

Glycogenolysis
(Liver glycogen)

Source during early fasting (12-18hrs)

Diet
after digestion and absorption

mostly

Gluconeogenesis
(mainly from AAs)

Main source during prolonged starvation (>18 hrs)

Blood Glucose

70-110mg/dl

Use

Oxidation

Storage

glycogenesis

Conversion

Lipogenesis

Proteins

- 20 amino acids → 8 are “essential”

“ESSENTIAL” AS THEY ARE NOT SYNTHESIZED IN HUMAN BODY AND MUST BE OBTAINED FROM DIETARY PROTIENS.

Functions:

- Body building
- Repair and maintenance of body tissues
- Maintenance of osmotic pressure
- Synthesis of bioactive substances and other vital molecules



Sources of protein:

- Eggs, meats, peanuts, milk, chicken, beans, seafood, soy products, and fish.

It should be more than 3.5 g/dl.

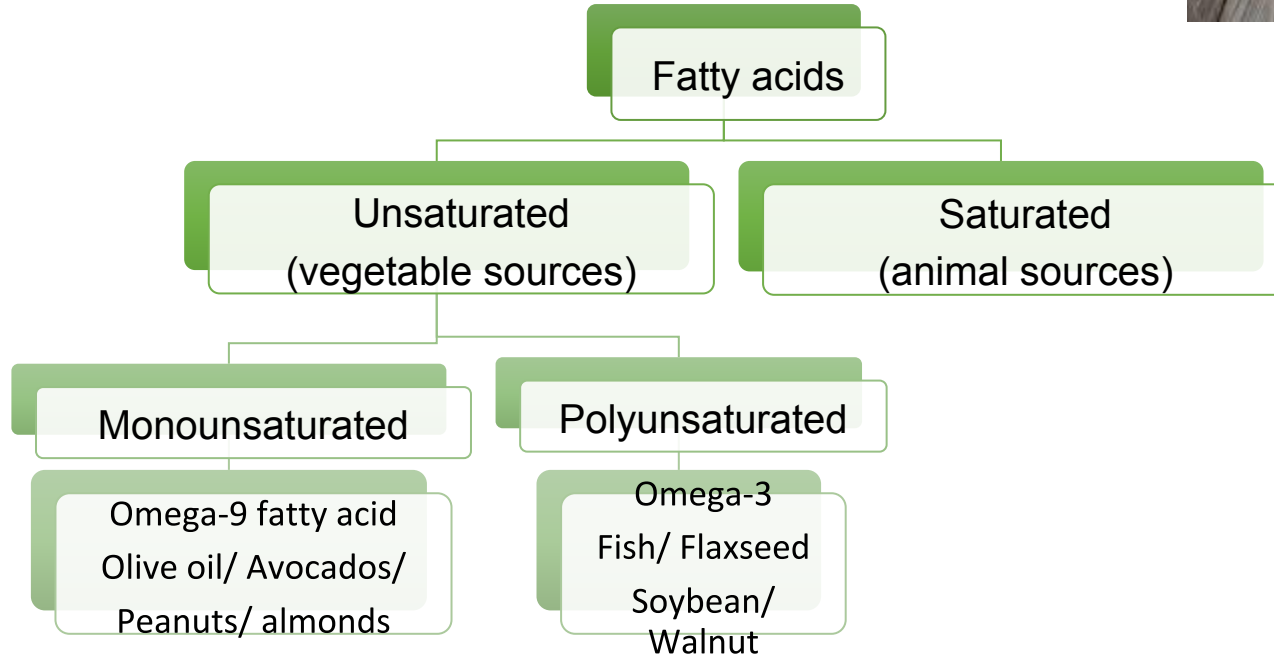
Less than 3.5 g/dl shows mild malnutrition.

Less than 3.0 g/dl shows severe malnutrition.



Fat

- Fat is a concentrated source of energy.



Essential fatty acids (EFA)

Can't be synthesized in human body:

1-Linoleic acid (an omega-6 fatty acid)=Sunflower oil Corn oil Soya bean oil Sesame oil

Groundnut oil Mustard oil Palm oil Coconut oil

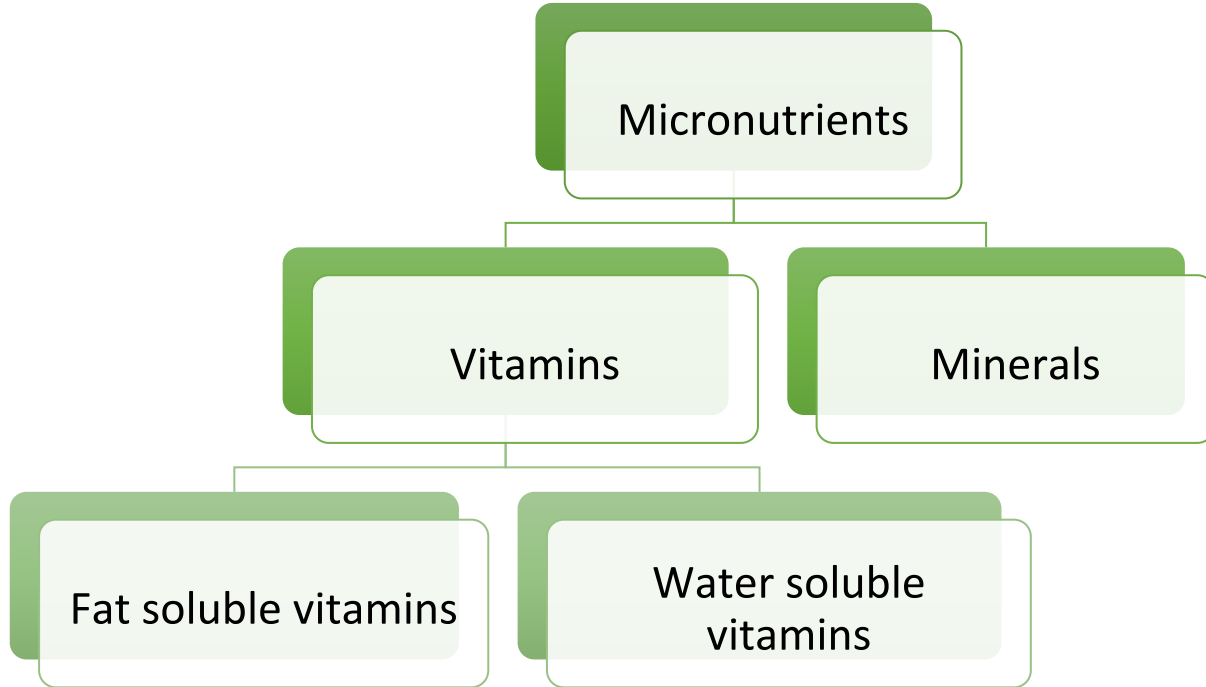
2-Arachidonic acid=Meat, eggs, milk

3-Linolenic acid (an omega-3 fatty acid) = Soya bean oil, Leafy greens

Functions of fats

- Source of high energy
- Vehicles for fat-soluble vitamins
- Support for visceral organs
- Insulation against cold.
- Growth, structural integrity of the cell membrane.

Micronutrients



Fat soluble vitamins



Vitamin	Function	Deficiency	Sources
A	Structure and function of epithelial tissue, normal vision, Growth and Reproduction.	Nightblindness Xerophthalmia May affect -immunity, dry skin, hair and fingernails	liver, beef, chicken, fortified milk, carrots, leafy and green vegetables and eggs
D	Bone reabsorption, collagen maturation	Rickets (in children) Osteomalacia osteoporosis	liver, beef, chicken, fortified milk, carrots, leafy and green vegetables and eggs
E	brain and nervous system, heart and RBC, skin and eye	Arrhythmia, neurological symptoms	Almonds, Spinach, Sweet Potato, Avocado, Sunflower seeds, Palm Oil, Olive oil
K	Blood clotting, Antioxidant, Brain function	bleeding, bruises	Green leafy vegetables kale, spinach, parsley, broccoli

Water soluble vitamins



Vitamin	Function	Deficiency	Sources
C	Antioxidant Collagen formation	Scurvy	Lemon, Strawberry, Spinach, Broccoli, Chili pepper
Thiamin (B1)	Carbohydrate utilization	Wernick's encephalopathy. Beriberi	Lentils, red meats, nuts, sunflower seeds, peas, milk, cauliflower, spinach
Pyridoxine (B6)	Metabolism, Healthy nervous system.	Neurological symptoms.	Meat, poultry, eggs, bananas, fish, potatoes and cooked spinach.
Cobalamin B12	synthesis of DNA Healthy RBC and nervous system	Macrocytic anemia, pernicious anemia, peripheral neuropathy, palpitation, memory loss depression, and lack of appetite.	Chicken, beef, fish, milk and eggs

Minerals



Vitamin	Function	Deficiency	Sources
Iron	Hemoglobin formation O2 binding to RBC	Iron deficiency anemia	Meat Chicken Liver Spinach Tomato Beets Kale
Iodine	Component of the thyroid hormones	Goiter Hypothyroidism In children (intellectual impairment, speech loss, short stature)	Sea Vegetables. Seafood

Healthy diet



MALNUTRITION

- Malnutrition is a medical condition resulting from a deficiency or excess of one or more essential nutrients (WHO, 1999)
- Excess nutrients intake results in overweight, which could lead to **obesity**
- Deficiency of nutrients intake leads to malnourishment or **undernutrition**

Double Burden of Malnutrition!

The double burden of malnutrition is characterised by the coexistence of undernutrition along with overweight and obesity, or diet-related noncommunicable diseases, within individuals, households and populations, and across the lifecycle.

This double burden of malnutrition offers a unique and important opportunity for integrated action on malnutrition in all its forms. Addressing the double burden of malnutrition will be key to achieving the Sustainable Development Goals (in particular Goal 2 and Target 3.4)



World Health Organization

THE DOUBLE BURDEN OF MALNUTRITION

WHAT

THE DOUBLE BURDEN OF MALNUTRITION IS CHARACTERISED BY THE COEXISTENCE OF:



Undernutrition (wasting, stunting & micronutrient deficiencies) along with overweight and obesity



and diet-related noncommunicable diseases



within individuals, households and populations



throughout life

WHERE



ACROSS THE GLOBE

1.9 BILLION
ADULTS, 18 years and older, are overweight
>600 MILLION of these are OBESE



264 MILLION WOMEN of reproductive age are affected by iron-amenable anaemia

462 MILLION ADULTS are underweight

42 MILLION children under the age of 5 years are **overweight or obese**

156 MILLION children are **stunted** (too short for age)

50 MILLION children are **wasted** (too thin for height)

WHY ACT

THE DOUBLE BURDEN IS AN IMPORTANT OPPORTUNITY FOR ACTION ON MALNUTRITION IN ALL ITS FORMS



Addressing malnutrition is essential to achieve the Sustainable Development Goals



Nutrition is critical to both health and economic development



Focus and investment for integrated solutions will tackle malnutrition in all its forms

GOOD NUTRITION



PROMOTES MATERNAL, INFANT AND CHILD HEALTH

IMPROVES SCHOOL & EDUCATION PERFORMANCE



SUPPORTS STRONGER IMMUNE SYSTEMS

REDUCES THE RISK OF DISEASE



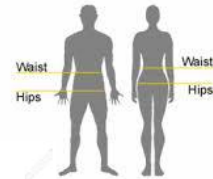
ASSESSMENT OF NUTRITION STATUS

• ANTHROPOMETRIC MEASURES

- Weight and height (under nutrition and over nutrition)
- Waist – hip ratio (central obesity)
- Mid arm circumference (lean body mass)
- Skin fold thickness (caloric reserve)

• Physical examination

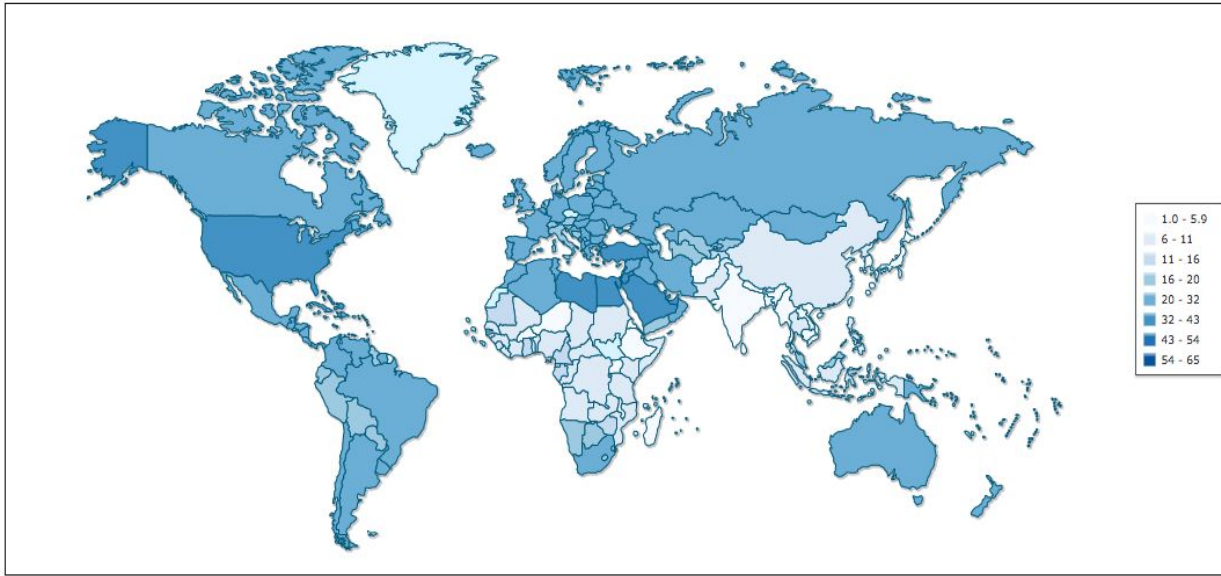
• Blood tests



Obesity + Obesity Prevalence

- Results from excess nutrients intake resulting in overweight, which could lead to **obesity**
- Obesity could also be influenced by genetic factors
- About 13% of the world's adult population (11% of men and 15% of women) were obese in 2016
- In 2016, 39% of adults aged 18 years and over (39% of men and 40% of women) were overweight.
- The worldwide prevalence of obesity nearly tripled between 1975 and 2016

Classification:	BMI (Kg/M2)
Overweight	≥ 25
Pre-obese	25-29.99
obese	≥ 30
Obese class 1	30-34.99
Obese class 2	35-39.99
Obese class 3	≥ 40



Saudi Trouble

Saudi Arabia faces a growing weight-related health crisis.

Overall obesity rate* **35.2%**

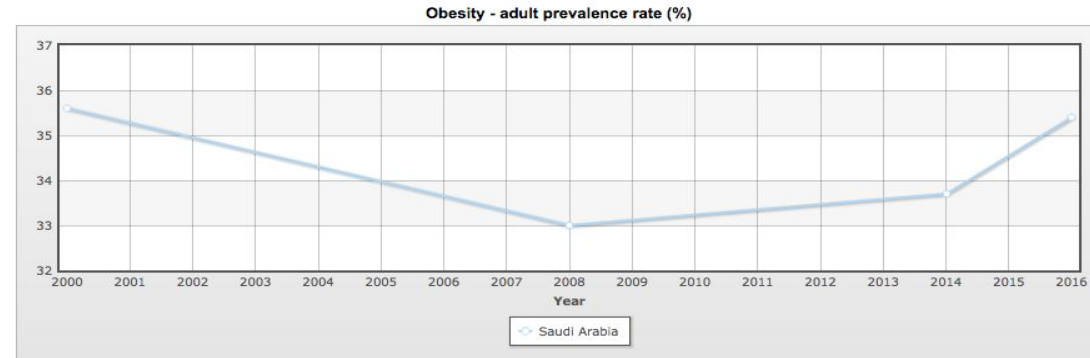
Obesity rate for school-age children **9.3%**

Obesity rate for preschool-age children **6.0%**

Bariatric surgeries in 2012 **11,000**

*Body-mass index of 30 or more
Sources: United Nations; Saudi Journal of Obesity; Aayed Alqahtani
The Wall Street Journal

Prevalence of obesity in adults- 2017



Country	2000	2008	2014	2016
Saudi Arabia	35.6	33	33.7	35.4

Health implication of obesity

- Hypertension
- CHDs
- Type-2 diabetes
- Morbidity and mortality

Determining factors of obesity

Dietary factors and lifestyle

- Lack of regular physical activities
- Genetic factors
- Urbanization and globalisation - influences diet change



Undernutrition

- Lack or inadequate intake of essential nutrients
- Loss of these essential nutrition from the body through disease and/ or malabsorption

types of undernutrition

1-Protein-energy undernutrition

2-Micronutrients Deficiency Undernutrition (MDMS), often referred to as "silent killer"

Classification	BMI cut-points (kg/M2)
Underweight/thinness	<18.50
Severe thinness	<16
Moderate thinness	16-16.99
Mild	17-18.49
Normal	18.50-24.99

Vulnerable groups risk of undernutrition

- Women (pregnant, lactating)
- Children (<5yrs)
- Adolescent girls
- Chronically ill people (e.g. people suffering from chronic tuberculosis, HIV etc),
- People affected by emergencies such as natural disasters – conflicts, floods and earthquake

Prevalence of undernutrition

- Nearly 1 billion people around the world are undernourished (are underweight)
- Undernutrition is more common in low and middle income countries
- 30% of world population (2 billion people) suffer from iron deficiency anaemia
- 43 million people worldwide are suffering from varying degrees of brain damage due to iodine deficiency
- Vitamin A is a clinical problem in 45 countries, and sub-clinical problem in 122 countries around the world

A microscopic view of numerous red blood cells, appearing as small, round, reddish-brown spheres. The cells are densely packed, with some showing a lighter center, characteristic of biconcave discs. The background is a soft, out-of-focus red.

Iron-Deficiency
Anemia

IDA (iron deficiency anemia) **in Saudi Arabia**

- In 2011, the overall prevalence of iron deficiency anemia in Saudi Arabia was → 30–56%

Children (% of children under 5) → 39.10 %.

Non-pregnant women → 40.30%

Pregnant women → 40.40 %

Vitamin D deficiency + Activation

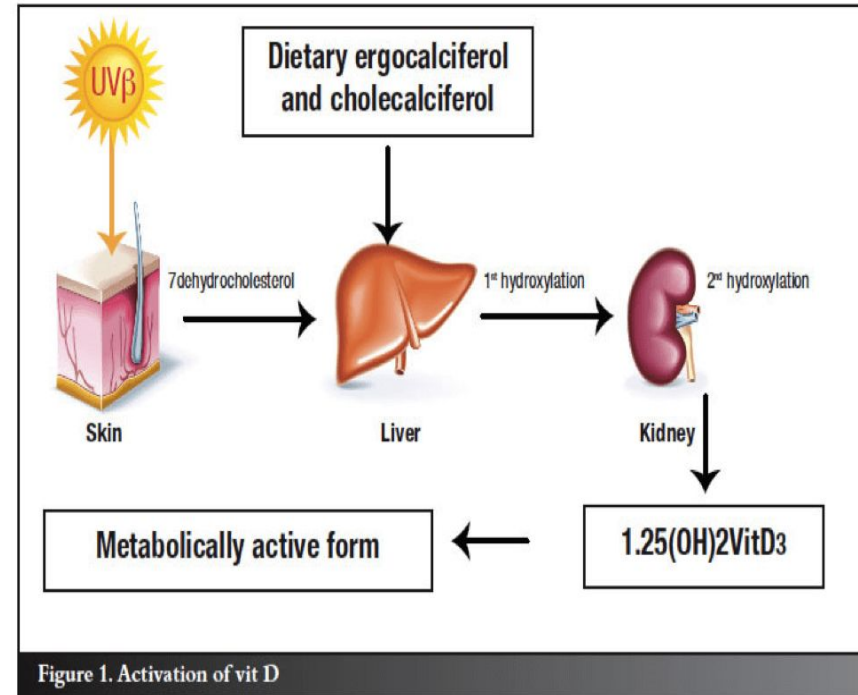
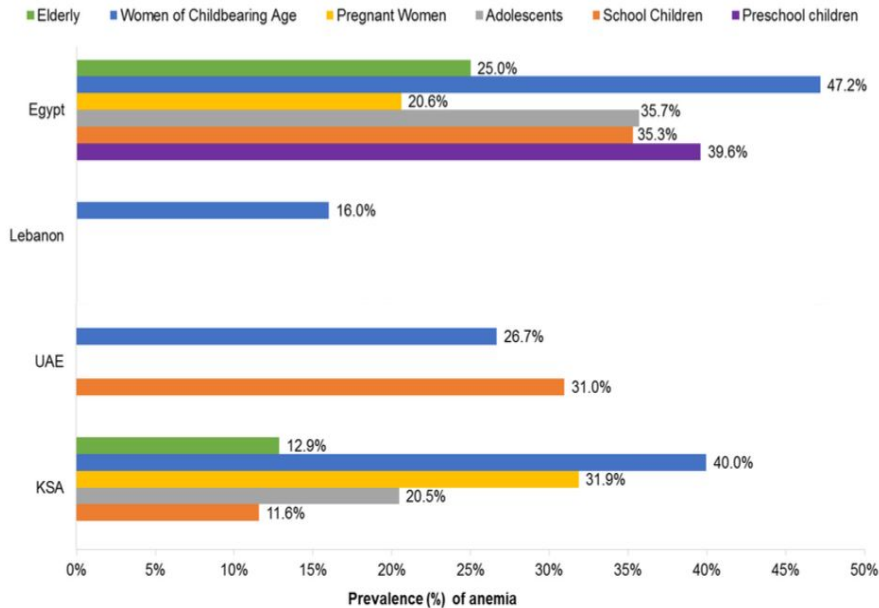
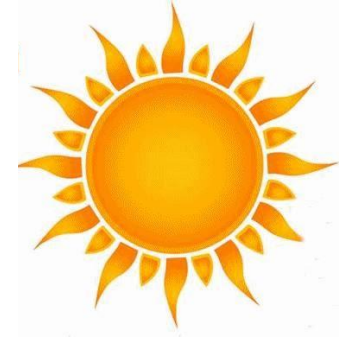
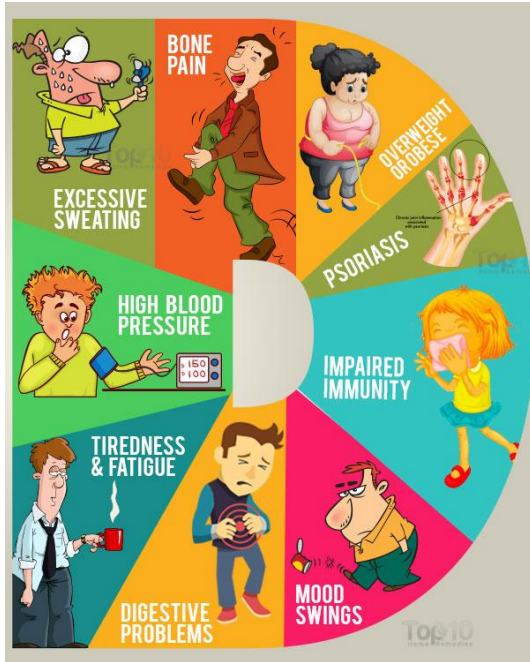


Figure 2. Prevalence of anemia in the Middle East by age and gender. (Sources: KSA [60,67,83,86,88];

Figure 1. Activation of vit D

Signs of vitamin D deficiency



Classical vitamin D deficiency disease

Rickets (in children)

Osteomalacia

Osteoporosis

Increased risk of
vitamin D deficiency

People with
limited sun
exposure

Overweight
people

Pregnant
women

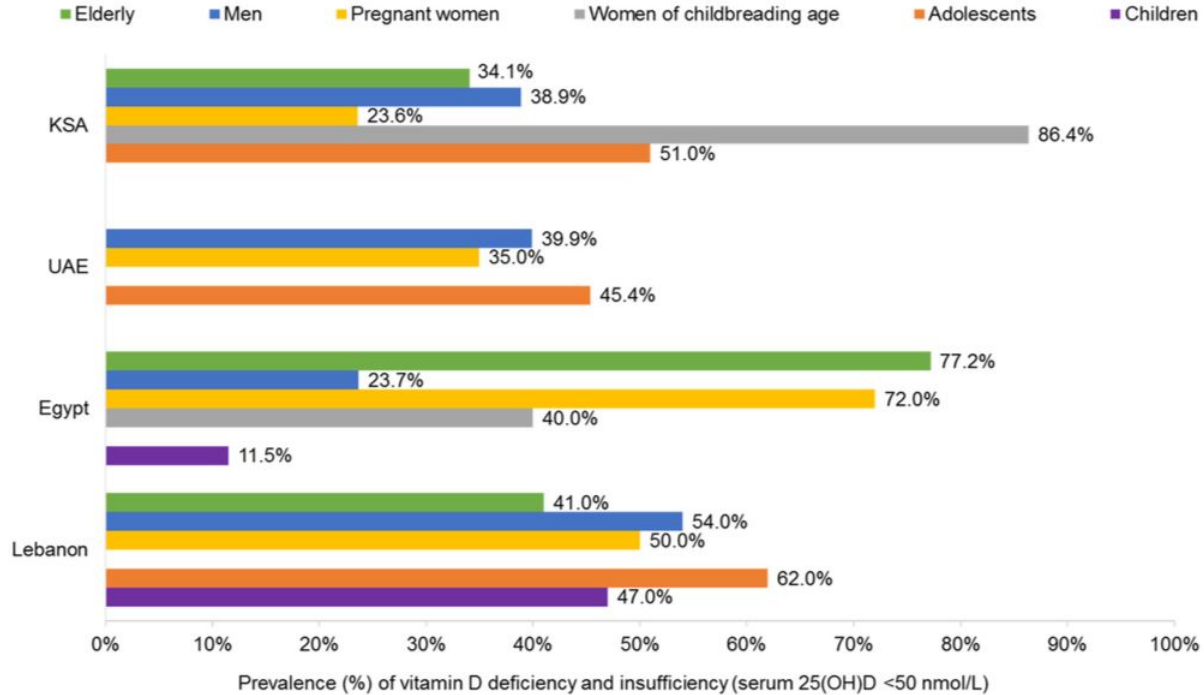
Chronic
illnesses

Insufficient
intake

Infants

Dark-ski
nned
people

The
elderly



Prevalence of vitamin D deficiency and insufficiency (serum 25(OH)D < 50 nmol/L) in the Middle East by age and gender Source: (Hwalla et al., 2017)

National nutrition programs

<https://www.moh.gov.sa/endepts/Nutrition/Pages/Feedingprograms.aspx>

Ministry of Health Portal
 Kingdom of Saudi Arabia

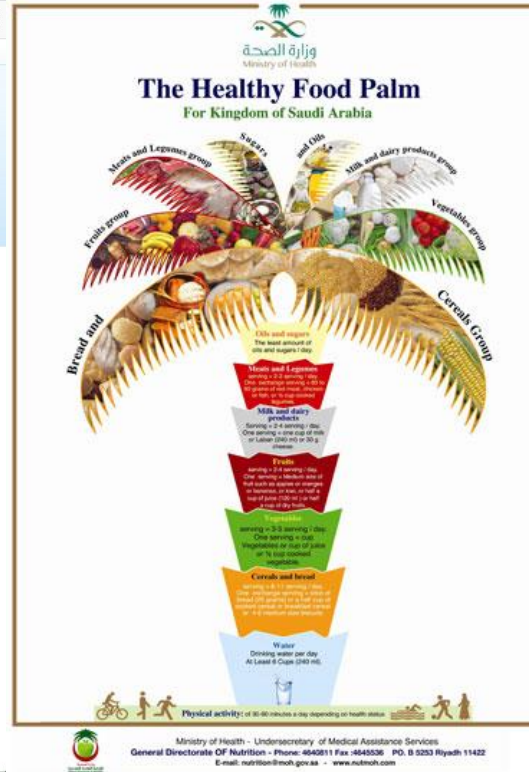
Ministry of Health Portal > MOH Departments > Nutrition General Department

Nutrition General Department

Nutrition Programs

- Breastfeeding Promotion Program
- Nutritional Surveillance Program
- Nutritional Anemia Control Program
- Micronutrient and Iodine Deficiency Disorders Control Program
- Saudi Nutritional Directory

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Dietary Guidelines for Saudis The healthy Food Palm

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