Applied Nutrition

Prepared By:

Prof. Mona Hegazy, MB Bch, M SC, MD

Prof. Fardous Soliman, MB Bch, M SC, PhD

Dr.Abdou Mahmoud,Nutrition and Food Science M Sc, PhD

Second Year

2018 / 2019

Acknowledgments

This two-year curriculum was developed through a participatory and collaborative approach between the Academic faculty staff affiliated to Egyptian Universities as Alexandria University, Ain Shams University, Cairo University, Mansoura University, Al-Azhar University, Tanta University, Beni Souef University, Port Said University, Suez Canal University and MTI University and the Ministry of Health and Population(General Directorate of Technical Health Education (THE). The design of this course draws on rich discussions through workshops. The outcome of the workshop was course specification with Indented learning outcomes and the course contents, which served as a guide to the initial design.

We would like to thank **Prof.Sabah Al- Sharkawi** the General Coordinator of General Directorate of Technical Health Education, **Dr. Azza Dosoky** the Head of Central Administration of HR Development, **Dr. Seada Farghly** the General Director of THE and all share persons working at General Administration of the THE for their time and critical feedback during the development of this course.

Special thanks to the **Minister of Health and Population Dr. Hala Zayed and Former Minister of Health Prof. Ahmed Emad Edin Rady** for their decision to recognize and professionalize health education by issuing a decree to develop and strengthen the technical health education curriculum for pre-service training within the technical health

توصيف مقرر دراسي

1- بيانات المقرر		
الرمز الكودي :	**اسم المقرر : Applied Nutrition**	**الفرقة /المستوى : 2nd year**
التخصص :	**عدد الوحدات الدراسية : نظرى: 2 hours** **عملى: 4 hours**	
2- هدف المقرر:	To develop practical skills on planning menus and preparing diet to fulfill all the nutritional needs of the individuals with different physiological and nutritional status in health and disease.	
3- المستهدف من تدريس المقرر :		
ا. المعلومات والمفاهيم :	Acquiring knowledge on basic nutrition definitions (RDA, DRI, UL,…) Revise nutritional requirements for different age groups Study malnutrition ;causes & symptoms Learn to read food label	
ب- المهارات الذهنية :	• Calculate Total Energy Requirements of individuals based on their physiological and nutritional states. • Use Food Composition table for calculating nutrients in different foods	
ج- المهارات المهنية الخاصة بالمقرر:	– Develop skills in assessment of nutritional status for healthy and diseased persons. – Apply knowledge to calculate nutrients' requirements in health and disease – Learn to plan diet using food exchange list and food composition tables. – Practice planning and preparing different hospital diets – Develop skills in creating simple nutrition messages for public (under supervision)	
د- المهارات العامة :	– Learn the relation between nutrition and diseases – Learn how to read Food label	
4- محتوى المقرر:	Learning tools needed for proper diet planning (such as weighing and serving measures, RDA tables, assessment of nutritional status, Food Composition Tables) Dietary planning for common pediatric and geriatric disorders. Common nutritional problems in outpatient clinics Adverse reactios to foods; Food Allergy, Intolerance & celiac disease. Therapeutic diet; definition, types & indications. Entral & parentral nutrition; nutrient needs& preparation.	

Case study presentation , discussion& evaluation.	
Tutorial sessions Practical classes Role play Assignments' discussion Case study	5- أساليب التعليم والتعلم
Students must be qualified with good intellectual and communication skills	6- أساليب التعليم والتعلم للطلاب ذوى القدرات المحدودة
	7- تقيم الطلاب :
Quiz Clinical skills Written exam Practical exam Final written exam	أ- الأساليب المستخدمة
Quiz at 5th week Midterm at 7th week Clinical skills during the semester Practical exam at 13th week Final written exam at 15th week	ب- التوقيت
Quiz at 5 marks Midterm 10 marks Attendance:5 marks Clinical skills : 20 marks Case study: 5 marks Practical exam at 15 marks Final written exam 90 marks Total: 150 marks	ج- توزيع الدرجات
	8- قائمة الكتب الدراسية والمراجع :
Notes from lectures	أ- مذكرات
Oxford handbook of clinical nutrition **Food Composition Tables of the National Nutrition Institute**	ب- كتب ملزمة
Basic nutrition and diet therapy	ج- كتب مقترحة
Journals of clinical nutrition	د- دوريات علمية أو نشرات ..... الخ

CONTENTS

Nutrition in Aging

Editors

Mona Hegazy

Professor of Internal Medicine

Gastroenterology and Hepatology Department

Clinical nutrition unit

Faculty of Medicine

Cairo University. Egypt

Vice President of the Egyptian Fellowship of Clinical Nutrition

monahegazy@hotmail.com

Fardous Soliman

Professor of Clinical Nutrition

Head of Clinical Nutrition Department

National Nutrition Institute

Cairo. Egypt

Board Member of the Egyptian Fellowship of Clinical Nutrition

Fardous_soliman@hotmail.com

Abdou Mahmoud

General Director of the General Department of Nutritional Programs

Ministry of Health and Population

Dep.Nutrition@yahoo.com

Preface

Thiscurriculumwasdevelopedthroughaparticipatoryandcollaborativeapproachbetween three eminent professors in this field. The design of this course draws on rich discussions for a whole week before starting work; to finalize the intended learning out-comes from the graduated student, the goal of his participation in the community, the role of being part of the Clinical Nutrition Team

Clinical nutrition II, and applied nutrition, will cover the goals for the second year graduation students, to gain updated and sufficient knowledge and skills to be enrolled in the Clinical Nutrition Team as an assistant of dietician in hospitals.

We hope this part applied nutrition will be of great help to our students to enrich their knowledge about clinical nutrition in different health aspects.

Editors

Course Description

This course will deal with medical nutrition therapy to develop practical skills on planning menus and preparing diet to fulfill all the nutritional needs of the individuals with different physiological and nutritional status in health and disease.

Core Knowledge

By the end of this course, students should be able to:

- Acquiring knowledge on basic nutrition definitions (RDA, DRI, UL,)
- Revise nutritional requirements for different age groups
- Study malnutrition ;causes & symptoms
- Learn to read food label

Core Skills

By the end of this course, students should be able to:

- Calculate Total Energy Requirements of individuals based on their physiological and nutritional states.
- Use Food Composition table for calculating nutrients in different foods
- Develop skills in assessment of nutritional status for healthy and diseased persons.
- Apply knowledge to calculate nutrients' requirements in health and disease
- Learn to plan diet using food exchange list and food composition tables.
- Practice planning and preparing different hospital diets
- Develop skills in creating simple nutrition messages for public (under supervision)
- Learn the relation between nutrition and diseases
- Learn how to read Food label

Methods of Teaching

- Lectures/ discussion
- Demonstrations
- Practical application
- Case studies
- Individual and group exercises
  Clinical work in outpatient& inpatients clinics

Course schedule

Week	Theoretical sessions	Practical sessions
1st	-Weighing and serving measures - giving case study as an assignments for every student to be discussed and evaluated on the last week of the course.	Using weighing and serving measures in diet planning
2nd	Diet planning	-Determination of Energy from Carbohydrate, Protein and Fat. -Estimating the Energy Requirements of individuals. -differentiate between different nutrition reference values; RDA,EAR,UL,.. -Planning diet using Food Exchange List for different diseases.
3rd	Diet planning	Planning diet using Food Composition Tables for selected diseases. Plan low sodium diet, low potassium, low oxalate, low urate, gluten free ,low FODMAP diet , high protein diet ,..
4th	Malnutrition	Training under supervision in in & out-patient clinics (or case study) to practice : -Assessing nutritional status -Detecting cases of malnutrition -Planning diet for common malnutrition disorders (under weight, anemia, vitamin D and calcium deficiency)
5th	Common nutritional problems in outpatient clinics	Training under supervision in outpatient clinics (of the National Nutrition Institute) to practice: -Assessing nutritional status -Putting dietary plan for different cases -Developing nutrition message
6th	Adverse reactions to food; food allergy, intolerance & celiac disease	-Reading food labels to detect allergens -Planning diet for children with cow's milk allergy -Planning menus for mixed allergy aiming at preventing allergic reactions and malnutrition. -planning dietary menus for patients with celiac disease
7th	Therapeutic diet; definition, types & indications.	Planning and preparing different hospital diets: - Regular diet - Clear liquid diet - Soft diet - Blenderized food

8th	Entral & parentral nutrition	Planning and preparing entral feeding menus according to patient requirement Designing a plan for Starting entral feeding with patients on parentral nutrition
9th	Pediatric nutrition	Visiting pediatric words under supervision (or case study) to practice: - Assessing nutritional status - Determination of nutrient requirement - Putting dietary plan for different pediatric cases
10th	Pediatric nutrition	Visiting pediatric words under supervision (or case study) to practice: - Assessing nutritional status - Determination of nutrient requirement - Putting dietary plan for common pediatric diseases
11th	Geriatric nutrition	Visiting geriatric words under supervision (or case study) to practice: - Assessment of nutritional status - Modification of diet to go with physiological changes of elderly - Putting dietary plan for different cases
12th	Assignments' case study discussion& evaluation	For each case study ,the following will be presented by the student and discussed & evaluated by the supervisor: - Nutrition assessment -Putting dietary plan for the given case -Developing nutrition message

PART I:

Nutrition Education

Principles of nutrition education

Criteria of Nutrition Education (NE) materials

Nutrition messages

Useful websites

Fardous Solima, PhD

Nutrition Education

Principles of Nutrition Education

Definitions and goals of nutrition education

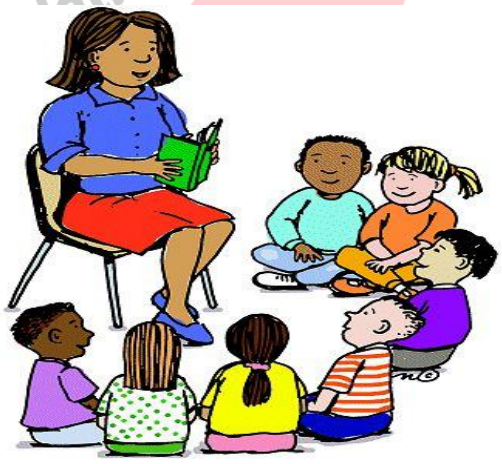
- Nutrition education is a part of Applied Nutrition that focuses its resources toward learning, adaptation and acceptance of healthy eating habits.
- Nutrition education‘s main goal is to make people aware of what constitutes a healthy diet and ways to improve their diets and their lifestyles.
- Nutrition education can be done through different channels and involves activities at the individual, community, and policy levels.

The Role of Nutrition Education Programs:

- National nutrition education programs are found to be effective in improving child growth and anemia and in modifying dietary practices that affect chronic disease.
- Identify, enhance, develop and strengthen national capacities to provide nutrition education for the general public, school children and vulnerable groups.
- Improving maternal and young child feeding
- Linking nutrition and family agriculture
- Promoting nutrition learning in schools
- Education and advocacy on hunger and malnutrition for children and youth

➢ Who needs nutrition education?

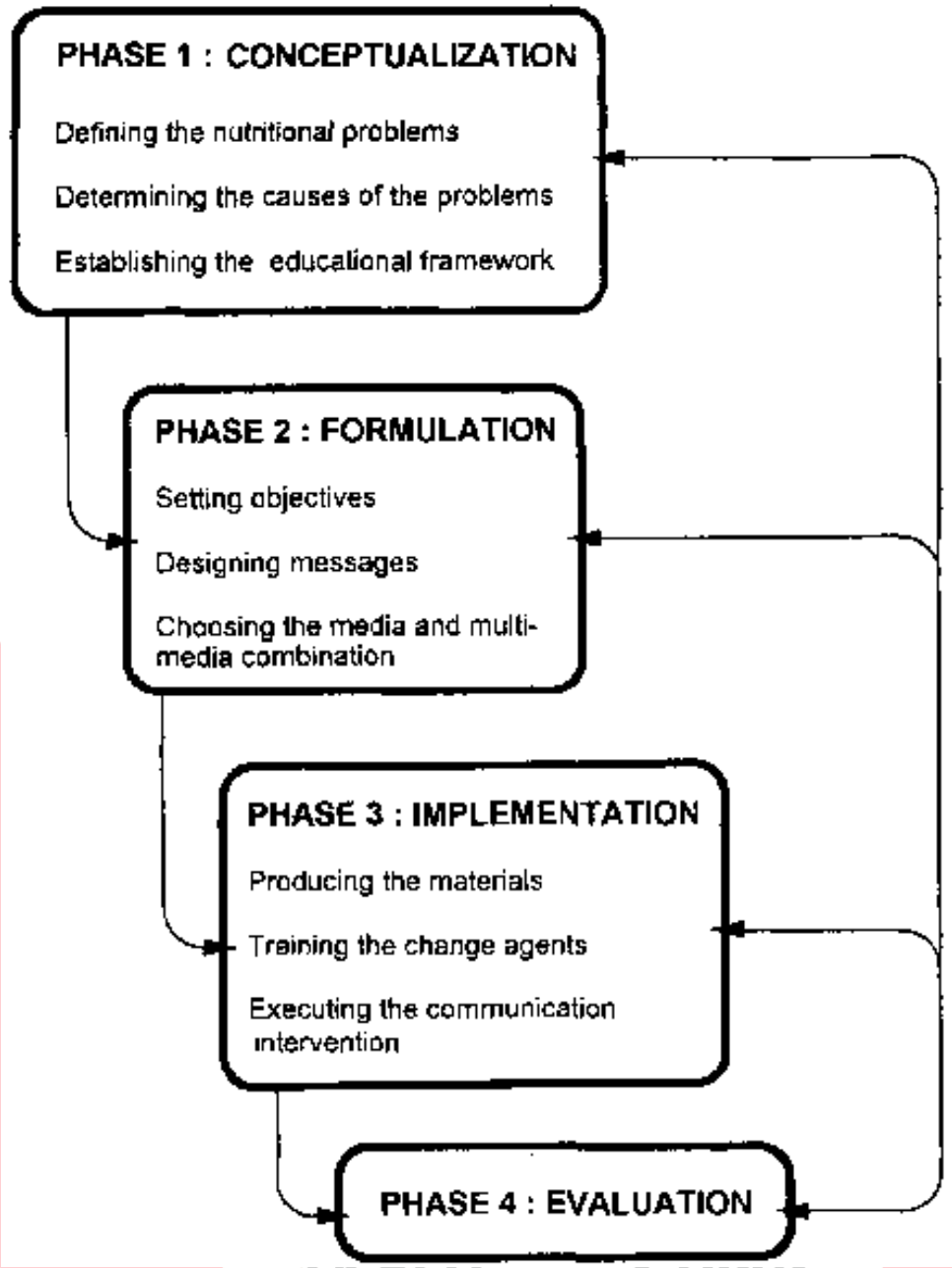
Nutrition education is needed in all groups to protect people’s health:



- Mothers,husbands and also teachers need to know and practice good nutrition for themselves, and also for children.
- Those who are caring for children and for the sick people
- Schoolchildren
- People living with chronic diseases that need dietary intervention.

➢ Scheme for planning nutrition education

The scheme for planning is based on four phases:



Evaluation must respond to the following 2 questions:

1. **Have the objectives been achieved?**
2. **Has the implantation process satisfying the targeted population?**

➢ Criteria of Nutrition Education (NE) materials

NE materials should be:

1. Obvious and clear message goal.
2. No more than 3-4 key messages
3. Short direct, clear, and concise sentences
4. Including most important information at first
5. Repeat the idea many times
6. Not including unnecessary information
7. Including direct pronouns such as “you”
8. Clear and simple headings, subheadings, and bulleted lists
9. Including visuals, pictures or graphs
10. Including relevant examples

	Action:	Audience:	Desired Outcome:	Evaluation Metric:
I want to				

- **The Media**:

The media are the channels of communication through which NE messages are transmitted. The Two types of media are:

1. **Face to Face communication**: interpersonal or group communication.

2. **The mass media**: which include:

- **Social media** : Examples : Facebook, Twitter, Pinterest, Instagram
- **Digital content** :Examples: websites, blog posts, videos, apps
- **Print materials** : Examples: handouts, brochures, posters
- **Mass media** :Examples: radio, TV, newspapers, news websites

Health literacy

Health literacy is the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decision.

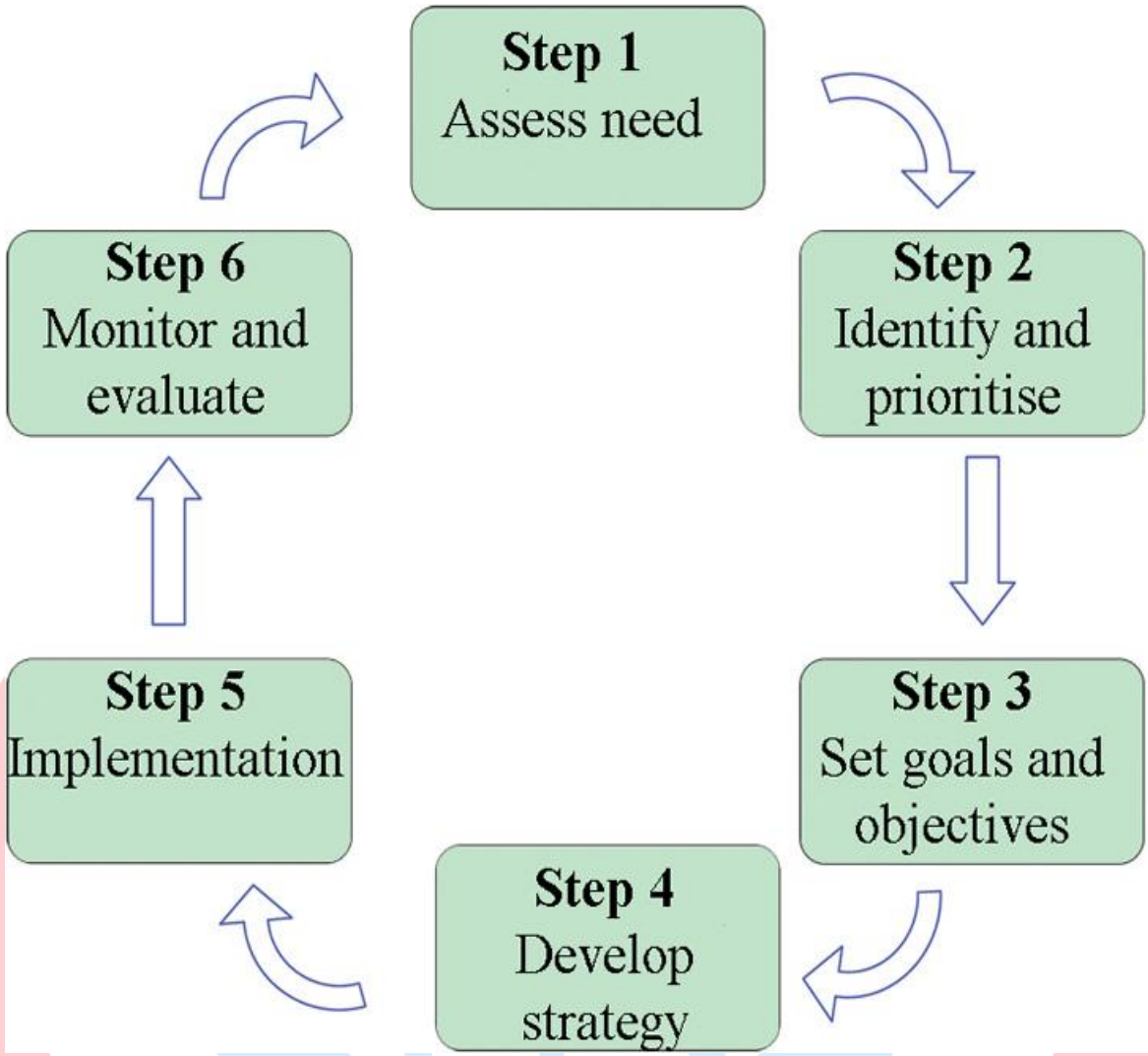
Why is health literacy important?

- Limited health literacy is associated with poorer health outcomes and higher health care costs.

Populations most likely to experience low health literacy include:

- Older adults
- People who do not have a high school degree
- People experiencing low-income levels
- People with compromised health status

Steps for developing nutrition strategy



PHASE 1: PREPARATION

- Defining the nutritional problems
- Determining the causes of the problems
- Establishing the educational framework

PHASE 2: FORMULATION

- Setting objectives
- Designing messages
- Choosing the media and multimedia combination

PHASE 3: IMPLEMENTATION

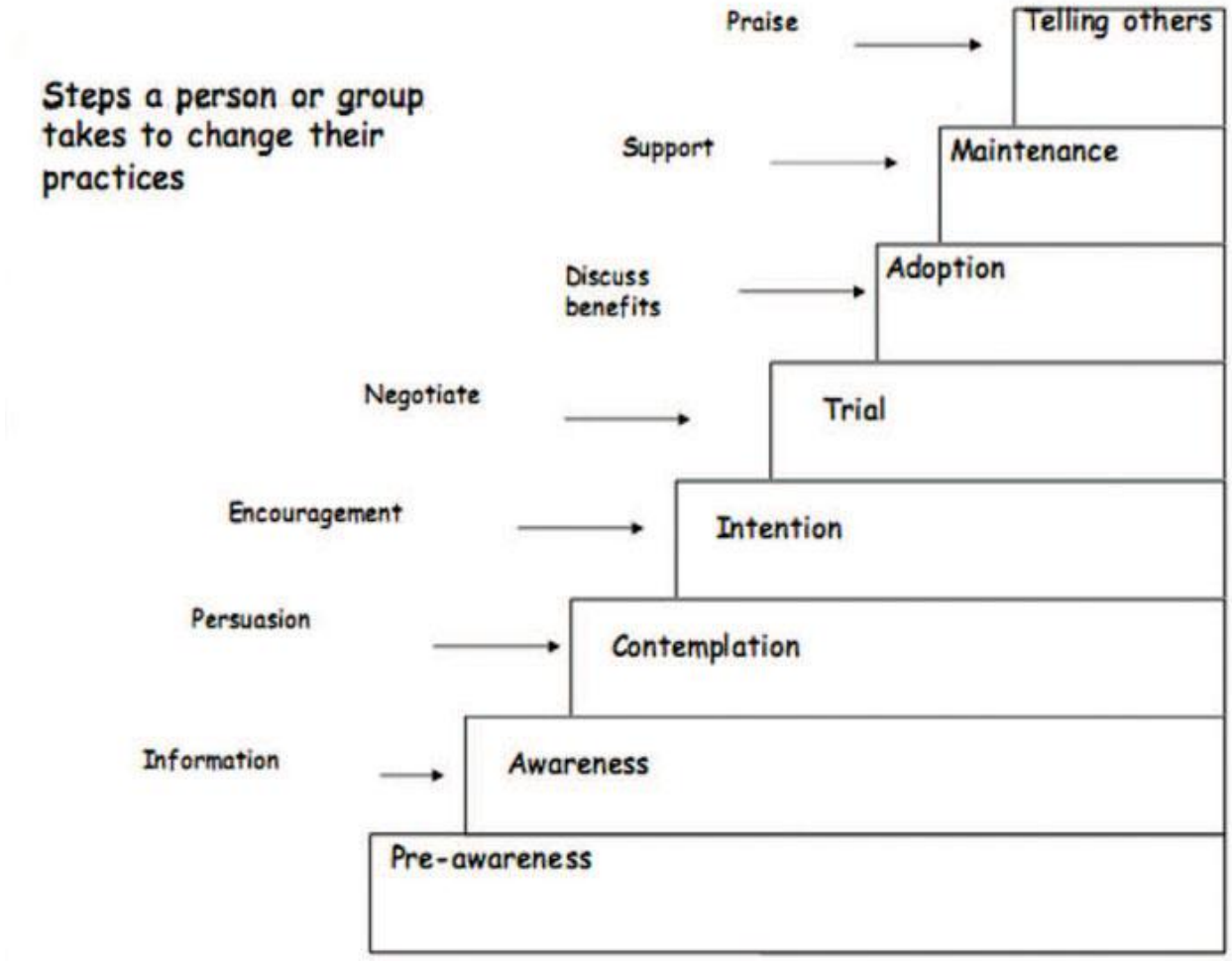
- Producing the materials
- Training the change agents
- Executing the communication intervention

PHASE 4: EVALUATION

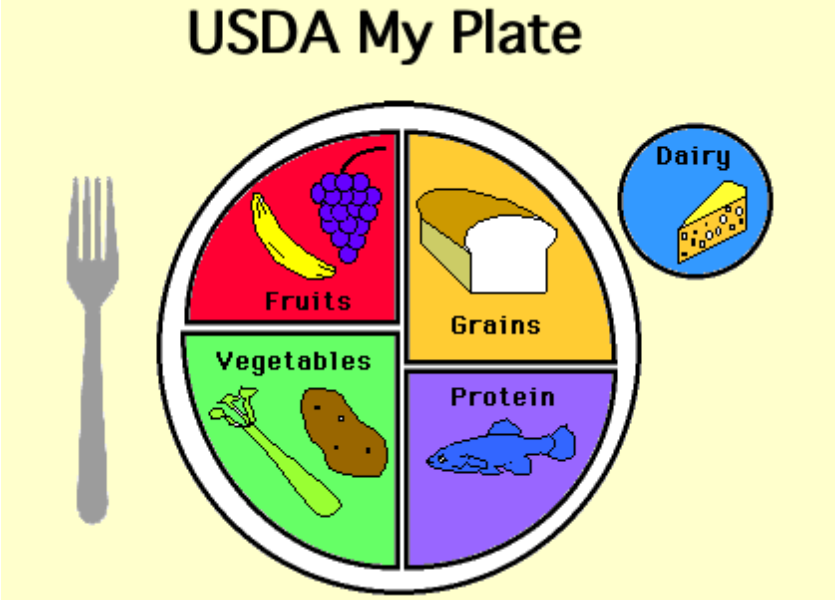
- **Nutrition behavior change communication** is different from nutrition education.
- **Nutrition education, aims at increasing awareness or knowledge**
- **Behavior change communication is an ongoing process that requires effective communication to persuade, encourage and support change.**

For example, a mother has not tried exclusive breastfeeding, there needs to be at least three contacts between you and the mother to change her behavior and to help her progress from the awareness stage to the trial stage**.**

Stages of behavior change



Stages of behavior change. (Source: Linkages project/AED Ethiopia, 2005, Behavioral change communication manual)



➢ Key Recommendations

The Key Recommendations for healthy eating patterns should be applied in their entirety to reflect an overall healthy eating pattern.

1. Consume a healthy eating pattern that accounts for all food and beverages within an appropriate calorie level.
   A healthy eating pattern includes:
   a) A variety of vegetables from all of the subgroups— dark green, red and orange, legumes (beans and peas), starchy, and other
   b) Fruits, especially whole fruits
   c) Grains, at least half of which are whole grains
   d) Fat-free or low-fat dairy, including milk, yogurt, cheese, and/or fortified soy beverages
   e) A variety of protein foods, including seafood, lean meats and poultry, eggs, legumes (beans and peas), and nuts, seeds, and soy products.
   f) Oils
2. A healthy eating pattern limits:
   a) Saturated and trans fats
   b) added sugars
   c) Sodium.

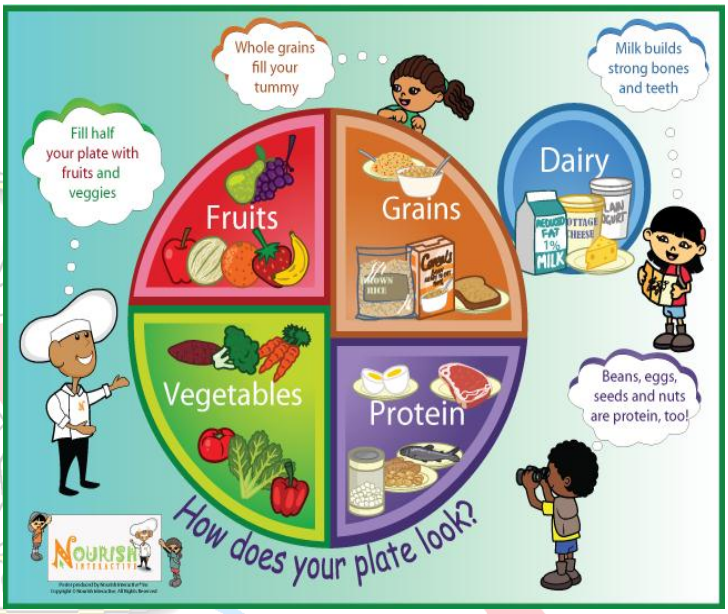
Key Recommendations that are quantitative are provided for several components of the diet that should be limited. These components are of particular public health concern, and the specified limits can help individuals achieve healthy eating patterns within calorie limits:

1. Consume less than 10% of calories per day from added sugars
2. Consume less than 10% of calories per day from saturated fats

3. Consume less than 2,300 milligrams (mg) per day of sodium
4. If alcohol is consumed, it should be consumed in moderation – up to one drink per day for women and up to two drinks per day for men – and only by adults of legal drinking age.

Diet and physical activity are the two parts of the calorie balance equation to help manage body weight, promote health and reduce the risk of chronic disease.

Examples of simple educational messages:



Exercise:

1. Give education ideas to encourage mothers to breast feed their infants
2. Plan a poster for schoolchildren explaining how to get their healthy diet

Remember

A healthy eating pattern should be tailored to the individual's personal, cultural and traditional preferences as well as food budget.

When you decide to create your own nutrition education materials based on the Dietary Guidelines please consider the following practices:

1. Know characters of your audience :
    - Their age and physiological status (adolescent, pregnant or lactating),their reading ability, education level and level of health literacy.
    - Are there relevant cultural practices to keep in mind?
      + Religious practices (Examples: dietary restrictions, religious fasting)
      + Cultural foods(Examples: celebration foods, food availability)
    - Do they have specific nutritional or health concerns?
      (Example: diabetes, hypertension, obesity, food allergies
2. Tailor messages to your audience putting health literacy in consideration.
3. Use simple, clear and short sentences.
4. Revise you material.
5. Make the most benefits through partnership.

Useful websites

1. http://www.fao.org/ag/humannutrition/nutritioneducation/62758/en/
2. https://wicworks.fns.usda.gov/resources/spend-smart-eat-smart
3. https://www.choosemyplate.gov/best-practices-creating-nutrition-education-materials
4. https://wicworks.fns.usda.gov/

PART II:

Meal planning

Basis of meal planning

Food Exchange List

Food Composition Tables

Useful websites

Abdou Mahmoud, PhD

Meal planning

Basis of meal planning

Energy Calculations

1. Use of Recommended Dietary Allowances (RDA) for estimation of energy requirements
2. Determine the Components of Energy Expenditure
3. Ratio Method to Determine Estimated Energy Requirement
4. Equations to Determine Estimated Energy Requirement (EER)

Calculation of Ideal Body Weight

WHO: Nutrition Recommendations Guidelines for Meal Planning

Food Exchange System

- Energy and Macronutrient Values of the Exchange Lists
- The Food Lists:
  1. Starch
  2. Fruits
  3. Milk
  4. Non- starchy Vegetables
  5. Meat and Meat Substitutes
  6. Fats
- Household and metric measures

FOOD EXCHANGE SYSTEM & FOOD GUIDE PYRAMID

Case study: About how to use Food Exchange System in meal planning.

Food Composition Table

Case study: About how to use Food Exchange System in meal planning

Energy Calculations

- An important goal in human nutrition is to ensure that the energy ingested in food is adequate to meet energy demands.
- The (FAO/WHO/UNU, 2004) report defined Energy Requirement as "the amount of food energy needed to balance energy expenditure in order to maintain body size, body composition and a level of necessary and desirable physical activity, consistent with long-term good health". This includes the energy needed for the

optimal growth and development of children, for the deposition of tissues during pregnancy and for the secretion of milk during lactation consistent with good health of the mother and child.

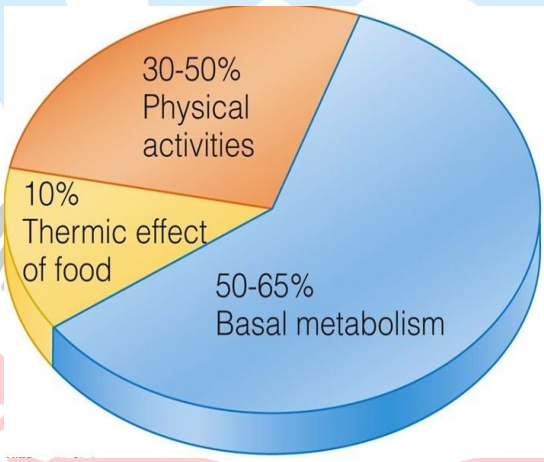
- The first important principle is that energy requirement must be estimated on the basis of energy expenditure and not of energy intake. It is based on the recognition that it is energy expenditure that drives energy needs rather than intake, which does not necessarily reflect energy needs and may vary independently.

a) Use of Recommended Dietary Allowances (RDA) for estimation of energy requirements

- RDAs are actually "recommendations" sufficient to meet the needs of a healthy population group over a period of time and should not be confused with "requirements" of a specific individual.
- Limitations: "RDA" needs to be adjusted for malnourished people or those with medical problems who may require supplemented or restricted intakes.

b) Determine the Components of Energy Expenditure

- The amount of energy spent in a day differs for each individual, but in general, basal metabolism is the largest component of energy expenditure and the thermic effect of food is the smallest. The amount spent in voluntary physical activities has the greatest variability, depending on a person's activity patterns.



1. **Basal metabolism**: the energy needed to maintain life when a body is at complete digestive physical and emotional rest.

- Basal metabolic rate (BMR): the rate of energy use for metabolism under specified conditions: after a 12-hour fast and restful sleep, without any physical activity or emotional excitement, and in a comfortable setting. It is usually expressed as k.cal perkilogram body weight per hour.
- Resting metabolic rate (RMR): similar to the basal metabolic rate (BMR), a measure of the Energy use of a person at rest in a comfortable setting, but with less stringent criteria for recent food intake and physical activity. Consequently, the RMR is slightly higher than the BMR.

Factors that Affect the BMR

Factor	Effect on BMR
Age	Lean body mass diminishes with age, slowing the BMR. The BMR begins to decrease in early adulthood (after growth and development cease) at a rate of about 2 percent/decade. A reduction in voluntary activity as well brings the total decline in energy expenditure to 5 percent/decade
Growth	In children and pregnant women, the BMR is higher.
Body composition (gender)	The more lean tissue, the higher the BMR (which is why males Usually have a higher BMR than females). The more fat tissue, the lower the BMR.
Fever	Fever raises the BMR Fever raises the BMR by 7 percent for each degree Fahrenheit.
Stresses	Stresses (including many diseases and certain drugs) raise the BMR.
Environmental temperature	Both heat and cold raise the BMR
Fasting/starvation	Fasting/starvation lowers the BMR Prolonged starvation reduces the total amount of metabolically active lean tissue in the body, although the decline occurs sooner and to a greater extent than body losses alone can explain. More likely, the neural and hormonal changes that accompany fasting are responsible for changes in the BMR.
Malnutrition	Malnutrition lowers the BMR.
Hormones (gender)	The thyroid hormone thyroxin, for example, can speed up or slow down the BMR. Premenstrual hormones slightly raise the BMR.
Smoking	Nicotine increases energy expenditure
Caffeine	Caffeine increases energy expenditure
Sleep	BMR is lowest when sleeping

Equation for Estimating Resting Energy Expenditure (REE)

a) Harris-Benedict

Men:

REE = 66.5 + [13.8 x Wight (kg)] + [5 x height (cm)] – [6.8 x age (years)]

Women:

REE = 655.1 + [9. 6 x Wight (kg)] + [1.8 x height (cm)] – [4.7 x age (years)]

b) Mifflin-St. Jeor

Women:

REE = [10 x weight (kg)] + [6.25 x height (cm)] - [4.92 x age (years)] – 161

Men:

REE = [10 x weight (kg)] + [6.25 x height (cm)] - [4.92 x age (years)] + 5

c) WHO/FAO/UNU

Girls and women (age range, years)
10 – 18 years : REE = [7.4 x weight (kg)] + [482 x height (m)] + 217
18 – 30 years : REE = [13.3 x weight (kg)] + [334 x height (m)] + 35
30 – 60 years : REE = [8.7 x weight (kg)] + [25 x height (m)] + 865
> 60 years : REE = [9.2 x weight (kg)] + [637 x height (m)] + 302
Men and boys (age range, years)
10 – 18 years : REE = [16.6 x weight (kg)] + [77 x height (m)] + 572
18 – 30 years : REE = [15.4 x weight (kg)] + [27 x height (m)] + 717
30 – 60 years : REE = [11.3 x weight (kg)] + [16 x height (m)] + 901
> 60 years : REE = [8.8 x weight (kg)] + [1128 x height (m)] + 1071

2. Physical Activity

- The second component of a person's energy output is physical activity: voluntary movement of the skeletal muscles and support systems. Physical activity is the most variable and the most changeable component of energy expenditure. Consequently, its influence on both weight gain and weight loss can be significant.
- During physical activity, the muscles need extra energy to move, and the heart and lungs need extra energy to deliver nutrients and oxygen and dispose of wastes. The amount of energy needed for any activity, whether playing tennis or studying for an exam, depends on three factors: muscle mass, body weight, and activity. The larger the muscle mass and the heavier the weight of the body part being moved, the more energy is expended.

Physical Activity Equivalents and Their PA Factors

Physical Activity PA	Men: 19 + yr. PA Factor	Women: 19 + yr. PA Factor	Boys: 3–18 yr. PA Factor	Girls: 3–18 yr. PA Factor
Sedentary Only those physical activities required for typical daily living	1.0	1.0	1.0	1.0
Low active Daily living + 30–60 min moderate activity	1.11	1.12	1.13	1.16
Active Daily living + ≥ 60 min moderate activity	1.25	1.27	1.26	1.31
Very active Daily living + ≥ 60 min moderate activity *and* ≥ 60 min vigorous activity *or*≥ 120 min moderate activity	1.48	1.45	1.42	1.56

NOTE: Moderate activity is equivalent to walking at 3 to $4^{1}/_{2}$ mph.

3. Thermic Effect of Food

- When a person eats, the GI tract muscles speed up their rhythmic contractions, the cells that manufacture and secrete digestive juices begin their tasks, and some nutrients are absorbed by active transport. This acceleration of activity requires energy and produces heat; it is known as the thermic effect of food (TEF).
- The thermic effect of food is proportional to the food energy taken in and is usually estimated at 10 percent of energy intake. Thus a person who ingests 2000 kcal probably expends about 200 calories on the thermic effect of food.
- The proportions vary for different foods, and are also influenced by factors such as meal size and frequency. In general, the thermic effect of food is greater for high-protein foods than for high-fat foods

Thermic effect of foods:

• Carbohydrate: 5–10%
• Fat: 0–5%
• Protein: 20–30%
• Alcohol: 15–20%

Estimating Energy Requirements (EER)

Total Energy Requirements = (Resting Energy Expenditure REE× Physical Activity Factor PA) + Thermic effect of foods.

- **Thermic effect of foods** = (REE × PA) 10/100

4. Stress Factors.

- To determine energy requirements for hospital patients: adjust the RMR value with "stress factors" that account for medical problems and, in some cases, medical treatments. In ambulatory patients, a factor for activity level may also be necessary.

- Critical care patients may have energy needs that are considerably higher than normal due to fever, mechanical ventilation, restlessness, or the presence of open wounds. Patients who are critically ill are usually bedridden and inactive, however, so the energy needed for physical activity is minimal.

For Hospital Patients
Estimating Energy Requirements (EER)

Total Energy Requirements = [(REE × PA In ambulatory patients) + Thermic effect of foods] × appropriate stress factor

- For a patient who is not confined to bed (ambulatory patients), an additional activity factor can be applied to accommodate the extra energy needs The activity factor for a hospitalized patient often falls between 1.1 and 1.3, and it is likely to change as the patient's condition improves

Patient's Activity Factor:

- Resting 1.1
- Confined to bed 1.2
- Out of bed 1.3

Injury Factor (IF)

Clinical Status	Energy Stress Factor
Elective surgery	1.0-1.2
Multiple trauma	1.2-1.6
Severe infection	1.2-1.6
Peritonitis	1.05-1.25
Multiple/ long bone fracture	1.1-1.3
Infection with trauma	1.3-1.5
Sepsis	1.2-1.4
Closed head injury	1.3
Cancer	1.1-1.45
Burns (% BSA) Body Surface Area	
0-20 %	1.0-1.5
20-40 %	1.5-1.85
40-100 %	1.85-2.05
Fever	1.2 per 1 degree C > 37 degree C

Note

- Never reduce the energy intake to below that required for basal energy needs.
- Increase 500 kcal/day to gain 0.45 kg/week
- Decrease 500 kcal/day to lose 0.45 kg/week.

c)Ratio Method to Determine Estimated Energy Requirement

Provides an estimate of total energy requirements

Pros

• Ease of use • No height required • Allows for different disease states

Cons

Does not take into account age or gender differences or physiological status of the individual

• Not evidence based for individual patient use

•Does not take into account body composition although can be combined with adjusted body weight formula

Ratio Method	Values kcal/kg		
Wight status	Sedentary Activity	Moderate Activity	Heavy Activity
Over weight	20-25	30	35
Normal weight	30	35	40
Under weight	35	40	45-50

d) Equations to Determine Estimated Energy Requirement (EER)

The DRI Committee has developed estimates of total energy expenditure

Infants	
0–3 months	EER = (89 ×weight - 100) + 175
4–6 months	EER = (89 ×weight - 100) + 56
7–12 months	EER = (89 ×weight - 100) + 22
13–15 months	EER = (89 ×weight - 100) + 20
Children and Adolescents	
Boys	
3–8 years	EER = 88.5 - (61.9 × age) + PA × [(26.7 × weight) + (903 × height)] + 20
9–18 years	EER = 88.5 - (61.9 × age) + PA × [(26.7 × weight) + (903 × height)] + 25
Girls	
3–8 years	EER = 135.3 - (30.8 × age) + PA × [(10.0 × weight) + (934 × height)] + 20
9–18 years	EER = 135.3 - (30.8 × age) + PA × [(10.0 × weight) + (934 × height)] + 25
Adults	
Men	EER = 662 - (9.53 × age) + PA × [(15.91 × weight) + (539.6 × height)]
Women	EER = 354 - (6.91 × age) + PA × [(9.36 × weight) + (726 × height)]
Pregnancy	
1st trimester	EER = non-pregnant EER + 0
2nd trimester	EER = non-pregnant EER + 340
3rd trimester	EER = non-pregnant EER + 452
Lactation	
0–6 months postpartum	EER = non-pregnant EER + 500 - 172
7–12 months postpartum	EER = non-pregnant EER + 400 - 0

NOTE:

- Select the appropriate equation for gender and age and insert weight in kilograms, height in meters, and age in years.
- Select the Physical Activity Equivalents "table of Physical Activity PA Factors"
- Used for non-obese population groups:

1. Adults: BMI < 25.0
2. Children: BMI for age & gender < 95th percentile.

Calculation of Ideal Body Weight (IBW)

Hamwi Formula to Calculate Ideal Body Weight (IBW)

Dr. GJ Hamwi formula was established in 1964 and is based on the belief that a woman who is 5 feet tall should weigh 100 pounds. On the other hand, 5 feet tall man should weigh 106 pounds.

The formula is ahead to introduce a new concept of Body Frame in adjusting the ideal body weight. The results can be adjusted with either 10% for those with a big body frame or 10% for those with a smaller frame. Because of this adjustment, the Hamwi formulae is one of the most applied formulae in weight calculators.

Women IBW = 100 lbs. for first 5 feet in height + 5 lbs. for each inch over 5 feet.

Example: Female patient is 5 feet and 7 inches tall. IBW = 100 + (5 × 7) = 135 lbs.

= 135/2.2 = 61.3 kg.

Men IBW = 106 lbs. for first 5 feet in height + 6 lbs. for each inch over 5 feet.

Example: Male patient is 5 feet and 11 inches tall.

IBW = 106 + (6 × 11) = 172 lbs.

= 172 / 2.2 = 78 kg

Frame Size Calculation

Formula for calculating frame size (r).

r = Height (cm) / Wrist circumference (cm)

Frame size	Females	Males
Small	>10.4	> 11.0
Medium	= 9.6-10.4	= 10.1-11.0
Large	< 9.6	< 10.1

Frame Adjustments (Men and Women)

For a small frame, subtract 10 percent of the total wt.

For a large frame, add 10 percent to the total wt.

For heights less than 60 inch, subtract 5 lbs. for each inch below 60 inch

How to Calculate Percent of IBW

Percent of IBW = (Actual Weight / IBW) × 100

How to Calculate Percent of Weight Change

Percent weight change = [(Usual weight - Actual weight)/usual weight] × 100

Adjusting Body weight : For obese patients if the body weight falls between an estimated ideal weight and the patient's actual weight.

Adjusted body weight = ideal weight + [0.25 × (actual weight - ideal weight)]

Body Mass Index Classifications BMI for both Men and Women

Describes relative weight for height

BMI = Wt. (kg) / Ht (m^2)

- Underweight BMI BMI<18.5

- Healthy Weight BMI 18.5-24.9

- Overweight BMI 25-29.9

- Obese BMI 30 or greater

Conversions:
LENGTH
1 centimeter (cm) = 0.39 inches (in)
1 foot (ft.) = 30.5 centimeters (cm)
1 foot (ft.) = 12 inch
1 inch (in) = 2.54 centimeters (cm)
1 meter (m) = 39.37 inches (in)

WEIGHT
1 kilogram (kg) = 2.2 pounds (lb.)

For example: Consider an active 30-yearoldmale who is 5 feet 11 inches tall and weighs 178 pounds.

1- Convert weight from pounds to kilograms and height from inches to meters.

- 178 lb./ 2.2 = 80.9 kg

- 71 in / 39.37 = 1.8 m

2- The level of daily physical activity PA factor = 1.25 for an active male

3- Determine the Body mass Index to describe relative weight for height

BMI = Wt. (kg) / Ht (m^2)

BMI = 80.9 / $(1.8)^2$

BMI = 25 kg/m^2 (normal body weight)

4-Then:insert age, PA factor, weight, and height into the appropriate equation

Estimated Energy Requirement equation:

EER = 662 - (9.53 × age) + PA × [(15.91 × weight) + (539.6 × height)]

EER = [662 - (9.53 × 30)] + 1.25 × [(15.91 × 80.9) + (539.6 × 1.8)]

EER = [662 - 286] + 1.25 × [1287 + 971]

EER = 376 + (1.25× 2258)

EER = 376 + 2823

EER = 3199 kcal.

The Estimated Energy Requirement for an active 30year-old male who is 5 feet 11inches tall and weighs 178 pounds is about3200 kcal/day.

WHO: Nutrition Recommendations Guidelines for Meal Planning

1. Energy: sufficient to support growth, physical activity, and a healthy body weight (BMI between 18.5 and 24.9) and to avoid weight gain greater than 11 pounds (5 kilograms) during adult life.
    a. Total fat: 15 to 30 percent of total energy
        - Saturated fatty acids: <10 percent of total energy
        - Polyunsaturated fatty acids: 6 to 10 percent of total energy
        - Omega-6 polyunsaturated fatty acids: 5 to 8 percent of total energy
        - Omega-3 polyunsaturated fatty acids: 1 to 2 percent of total energy
        - Trans-fatty acids: <1 percent of total energy

    b. Total Carbohydrate: 55 to 65 percent of total energy

- Sugars: <10 percent of total energy

    c. Total Protein: 10 to 15 percent of total energy

- Cholesterol: <300 mg per day
- Salt (sodium): <5 g salt per day (<2 g sodium per day), appropriately iodized
- Total dietary fiber: >25 g per day from foods

The Food Exchange system

The food exchange system is a valuable tool for roughly estimating the energy, protein, carbohydrate and fat content of a food or meal. In the exchange system individual foods are placed into three broad groups.

1- Carbohydrate group:

- Starch,

- Fruit,

- Milk (fat free, reduced fat and whole) and

- Vegetables.

2- Meat and meat substitute: Very lean, lean, medium-fat and high fat

3- Fat group: Monounsaturated, polyunsaturated and saturated fat

Serving Sizes: The serving sizes have been carefully adjusted and defined so that a serving of any food on a given list provides roughly the same amount of carbohydrate, fat, and protein, and, therefore, total energy. Any food on a list can thus be exchanged, or traded, for any other food on the same list without significantly affecting the diet's energy-nutrient balance or total calories.

I) Energy and Macronutrient Values of the Exchange Lists:

ExchangeGroup / Lists			Serving Size	Energy (kcal)	Carbohydrate (g)	Protein (g)	Fat (g)
Carbohydrates Group	Starch		One Exchange	80	15	3	0-1
	Fruits		One Exchange	60	15	0	0
	Milk	low-fat, 1% Reduced-	One Exchange	110	12	8	3
		fat, 2%	One Exchange	120	12	8	5
		Whole	One Exchange	150	12	8	8
	Non- starchy vegetables		One Exchange	25	5	2	0
Meat and Meat Substitutes Group	Very Lean		One Exchange	35	0	7	0-1
	Lean		One Exchange	55	0	7	3
	Medium-fat		One Exchange	75	0	7	5
	High fat		One Exchange	100	0	7	8
Fats Group			One Exchange	45	0	0	5

The energy value for each exchange list represents an approximate average for the group and does not reflect the precise number of grams of carbohydrate, protein, and

Fat. For example, a slice of bread contains 15 grams of carbohydrate (60 kcalories), 3 grams protein (12 kcal), and a little fat—rounded to 80 calories for ease in

Calculating. A 1⁄2 cup of vegetables (not including starchy vegetables) contains 5 grams carbohydrate (20 kcal.) and 2 grams protein (8 more), which has been rounded down to 25 kcalories.

Foods in the exchange list are grouped according to their energy-nutrient contents rather than by their source. For example, cheeses are grouped with meats (not milk) because, like meats, cheeses contribute energy from protein and fat but provide negligible carbohydrate. For similar reasons, starchy vegetables such as corn, green peas, and potatoes are found on the Starch list

with breads and cereals, not with the vegetables. Servings are based on standard measuring cups and spoons.

II)The Food Lists:

1)Starch

The Starch list includes bread, cereals and grains, starchy vegetables, crackers and snacks, and legumes (dried beans, peas, and lentils). 1 starch choice = 15 grams carbohydrate, 0–3 grams protein, 0–1 grams fat, and 80 kcalories.

Note: In general, one starch exchange is. Cup cooked cereal, grain, or starchy vegetable; 1⁄3 cup cooked rice or pasta; 1 ounce of bread product; 3/4. Ounce to 1 ounce of most snack foods.

Starch Exchange list:			One Starch Exchange equals
Bread	Bagel, large (about 4 oz.)		1/4 (1oz.)
	Bread reduced-kcalorie ☺		2 slices (1.5. oz.)
	Bread white, whole-grain,		1 slice (1 oz.)
	Pancake, 4 inches across, inch thick		1
Cereals and Grains	Barley, cooked		1⁄3 cup
	Bran, dry	Oat ☺	1/4 cup
		Wheat ☺	1/2 cup
	Bran, cooked (unsweetened, ready-to-eat)	cooked (oats, oatmeal) ☺	1/2 cup
		cooked wheat ☺	1 cup
	Couscous		1/3 cup
	Bulgur or Grits cooked		1/2 cup
	Pasta, cooked		1/3 cup
	Rice, white or brown, cooked		1⁄3 cup
	Wheat germ		Dry 3 Tbsp.
Starchy Vegetables	Peas, green ☺		½ cup
	Corn		1/2 cup
	Potato	baked with skin	1/4 large (3 oz.)
		Boiled mashed.	1/2 cup (3 oz.)
	Yam – sweet potato		1/2 cup
	Pumpkin		1 cup
Beans, Peas, and Lentils	*The choices on this list count as 1 CHO exchange plus1 very lean meat exchange.*		
	Lentils, cooked (brown, yellow) ☺		1/2 cup
	Beans, cooked (black, kidney, white) ☺		1/2 cup
	Peas, cooked (black-eyed, split) ☺		1/2 cup
	beans, canned ☺		1/2 cup
Crackers and Snacks	Popcorn (popped, no fat added or low fat microwave) ☺		3 cups

Beans, peas, and lentils are also found on the Meat and Meat Substitutes list.
☺More than 3 grams of dietary fiber per serving.

2)Fruits

The Fruits list includes fresh, frozen, canned, and dried fruits and fruit juices

1 Fruit choice = 15 grams carbohydrate, 0 grams protein, 0 grams fat, and 60 kcalories.

Note: In general, one fruit exchange is 1/2 cup canned or fresh fruit or unsweetened fruit juice; 1 small fresh fruit (4 ounces); 2 tablespoons dried fruit.

Fruits Exchange list:	One Fruit Exchange equals
Apple, unpeeled	small 1 (4 oz)
Apples, dried	4 rings
Applesauce, unsweetened	1/2 cup
Apricots canned	1/2 cup
Apricots dried	8 halves
Apricots fresh ☺	4 whole ($5^1/_2$oz.)
Banana, extra small	1 (4 oz.)
Blackberries ☺	3/4 cup
Blueberries	3/4 cup
Cantaloupe, small	1/3 melon or 1 cup cubed (11oz.)
Cherries sweet, canned	1/2 cup
Cherries sweet fresh	12 ones (3 oz.)
Dates	3 ones
Dried fruits (blueberries, cherries, cranberries, mixed fruit, raisins)	2 Tbsp.
Figs dried	$1^1/_2$
Figs fresh ☺	$1^1/_2$ large or 2 medium ($3^1/_2$ oz.)
Fruit cocktail	1/2 cup
Grapefruit	Large 1/2 (11 oz.)
Grapes,	small 17 (3 oz)
Kiwi ☺	1 ($3^1/_2$ oz)
Mango, small	1/2 ($5^1/_2$ oz) or 1/2 cup
Tangerines, small	2 (8 oz)
Orange, small ☺	1 ($6^1/_2$ oz)
Peaches canned ☺	1/2 cup
Peaches fresh, medium Pears canned	1 (6 oz) 1/2 cup
Pears fresh, large	1/2 (4 oz)

Pineapple canned		1/2 cup
Pineapple fresh		3/4 cup
Plums dried (prunes)		3
Plums small		2 (5 oz)
Strawberries ☺		$1^{1}/_{4}$ cup whole berries
Watermelon		1 slice or $1^{1}/_{4}$ cups cubes ($13^{1}/_{2}$ oz)
Fruit Juice	Apple juice/cider	1/2 cup
	Fruit juice blends, 100% juice	1/3 cup
	Grape juice	1/3 cup
	Grapefruit juice	1/2 cup
	Orange juice	1/2 cup
	Pineapple juice	1/2 cup
	Prune juice	1/3 cup

☺More than 3 grams of dietary fiber per serving.

The weight listed includes skin, core, seeds, and rind.

3)Milk

The Milk list groups milks and yogurts based on the amount of fat they have (fat-free/low-fat, reduced-fat, and whole). Cheeses are found on the Meat and Meat Substitutes list and cream and other dairy fats are found on the Fats list.

Note: In general, one milk choice is 1 cup 8 fluid ounces or 2/3 cup yogurt

Milk list:		One Milk Exchange equals
Fat-free or low-fat (1%) = 1 fat-free/low-fat milk choice = 12 g carbohydrate, 8 g protein, 0–3 g fat, and 110 kcal.	Milk , low-fat	1 cup
	Evaporated milk	1/2 cup
	Yogurt, low-fat plain or flavored with an artificial sweetener	2/3 cup (6 oz)
Reduced-fat (2%) = 1 reduced-fat milk choice = 12 g carbohydrate, 8 g protein, 5 g fat, and 120 kcal.	Milk, acidophilus milk, kefir, Lactaid	1 cup
	Yogurt, plain	2/3 cup (6 oz)
Whole Milk = 1 whole milk choice = 12 g carbohydrate, 8 g protein, 8 g fat, and 150 kcal.	Milk, buttermilk, goat's milk	1 cup
	Evaporated milk	1/2 cup
	Yogurt, plain	2/3 cup (6 oz)

Dairy-Like Foods

Food		Serving Size	Count as
Chocolate milk	fat-free	1 cup	1 fat-free milk + 1 carbohydrate
	whole	1 cup	1 whole milk + 1 carbohydrate
Smoothies, flavored, regular		10 oz	1 fat-free milk + $2^1/_2$ carbohydrates
Yogurt and juice blends		1 cup	1 fat-free milk + 1 carbohydrate

Sweets, Desserts, and Other Carbohydrates

1 other carbohydrate choice = 15 g carbohydrate, variable grams protein, variable grams fat, and variable k.calories.

Note: In general, one choice from this list can substitute for foods on the Starch, Fruits, or Milk lists

Food		Serving Size	Count as
Beverages	Soft drink (soda), regular	1 can (12 oz)	$2^1/_2$ carbohydrates
	Sports drink	1 cup (8 oz)	1 carbohydrate
Cake	Angel cake	2-inch square (about 2 oz)	2 carbohydrates
	Frosted cake	2-inch square (about 2 oz)	2 carbohydrates + 1 fat
Cookies	chocolate chip	2 cookies ($\mathbf{2^1/_4}$ inches across)	1 carbohydrate + 2 fats
	sandwich, with crème filling	2 small (about 2/3 oz)	1 carbohydrate + 1 fat
	vanilla wafer	5 cookies	1 carbohydrate + 1 fat
Pie	commercially prepared	1/6 of 8-inch pie	3 carbohydrates + 2 fats
	pumpkin or custard	1/8 of 8-inch pie	$1^1/_2$ carbohydrates + $1^1/_2$ fats
Cupcake, frosted		1 small (about $\mathbf{1^3/_4}$ oz)	2 carbohydrates + 1–$1^1/_2$ fats
Gelatin, regular		1/2 cup	1 carbohydrate
Pudding (made with reduced-fat milk)		1/2 cup	2 carbohydrates
Candy bar, chocolate /peanut		bars (1 oz)	$1^1/_2$ carbohydrates + $1^1/_2$ fats
Coffee creamer	dry, flavored	4 tsp	1/2 carbohydrate + 1/2 fat
	liquid, flavored	2 Tbsp	1 carbohydrate
Honey		1 Tbsp	1 carbohydrate
Jam		1 Tbsp	1 carbohydrate
Sugar		1 Tbsp	1 carbohydrate
Ice cream	fat-free	1/2 cup	$1^1/_2$ carbohydrates
	light	1/2 cup	1 carbohydrate + 1 fat
	regular	1/2 cup	1 carbohydrate + 2 fats

4)Non- starchy Vegetables

The Non-starchy Vegetables list includes vegetables that have few grams of carbohydrates or calories; starchy vegetables are found on the Starch list.

1 non-starchy vegetable choice = 5 g carbohydrate, 2 g protein, 0 g fat, and 25 kcal.

Note: In general, one non-starchy vegetable choice is 1/2 cups cooked vegetables or vegetable juice or 1 cup raw vegetables. Count 3 cups of raw vegetables or $1^1/_2$ cups of cooked vegetables as one carbohydrate choice.

Non-starchy Vegetables Exchange list:			
Spinach	4 Oz	Mushrooms, all kinds, fresh	
Artichoke	5 Oz	Okra	2 Oz
Beans green		Onions	2 Oz
Beets	2Oz	Peppers (all varieties) ☺	
Broccoli		Radishes	5 Oz
Cabbage	5 Oz	Squash	4 Oz
Carrots ☺	2 Oz	Sugar pea snaps	$2^1/_2$ Oz
Cauliflower		Tomato	4 Oz
Celery	4 Oz	Tomatoes, canned	$1^1/_2$ Oz
Cucumber	4 Oz	Tomato sauce Ω	
Eggplant	4 Oz	Tomato/vegetable juice Ω	
Greens (collard, turnip, lettuce)	4 Oz	Turnips	4 Oz

☺More than 3 grams of dietary fiber per serving.

Ω 480 milligrams or more of sodium per serving

5)Meat and Meat Substitutes

The Meat and Meat Substitutes list groups foods based on the amount of fat they have (very lean meat, lean meat, medium-fat meat, high-fat meat, and plant-based proteins).

Very Lean Meats and Meat Substitutes One very lean meat choice = 0 g carbohydrate, 7 g protein, 0 – 1 g fat, and 35 kcal	
Poultry : chicken, ostrich or turkey (white meat, no skin)	1 ounce
Fish: Tuna, canned in water or oil drained or cooked in water	1 ounce
Shellfish : shrimps - lobster – imitation shellfish	1 ounce
Egg whites	2 egg whites
Fat free cheese	1 ounce
Organ meats: kidney (high in cholesterol)	1 ounce

Lean Meats and Meat Substitutes One lean meat choice = 0 g carbohydrate, 7 g protein, 3 g fat, and 55 kcal	
Beef: roast (rib, steak ,flank, T-bone)	1 oz
Veal, lean chop, roast	1 oz
Fish, smoked: herring or salmon	1 oz
Salmon, Sardines canned	1 oz
Veal, lean chop, roast	1 oz

Goose (no skin), rabbit	1 oz
Organ meats: heart, liver (high in cholesterol)	1 oz

Medium-Fat Meat and Meat Substitutes One medium-fat meat choice = 0 g carbohydrate, 7 g protein, 5 g fat, and 75 kcal.	
Beef: most beef products, ground beef, Sausage	1 oz
Veal : ground, un breaded	1 oz
Lamb: ground, rib roast	1 oz
Poultry with skin: chicken; dove, duck, or goose; fried chicken: ground turkey	1 oz
Cheeses: feta, mozzarella, processed cheese spread.	1 oz
Egg Note: High in cholesterol, so limit to 3 per week.	1 egg
Fish: any fried product	1 oz
High-Fat Meat and Meat Substitutes One High-fat meat choice = 0 g carbohydrate, 7 g protein, 8 g fat, and 100 kcal. These foods are high in saturated fat, cholesterol, and kcalories and may raise blood cholesterol levels if eaten on a regular basis. Try to eat 3 or fewer servings from this group per week	
pork	1 oz
Fried Sausage or Hot dog (beef, turkey or chicken)	1 oz
Cheese: cheddar, hard goat	1 oz

Plant-Based Proteins

1 plant-based protein choice = variable grams carbohydrate, 7g protein, variable grams fat, and variable kcalories.

Food	Serving Size	Count as
Lentils, brown, green, or yellow ☺	1/2 cup	1 carbohydrate + 1 very lean meat
Beef" or "sausage" soy-based ☺	2 oz	1/2 carbohydrate + 1 lean meat
Chicken" nuggets, soy-based	2 nuggets ($1^1/_2$ oz)	1/2 carbohydrate + 1 medium-fat meat
Nut spreads: almond butter, cashew butter, peanut butter, soy nut butter	1 Tbsp	1 high-fat meat

☺ = More than 3 grams of dietary fiber per serving.

6)Fats

Fats and oils have mixtures of unsaturated (polyunsaturated and monounsaturated) and saturated fats. Foods on the Fats list are grouped together based on the major type of fat they contain. 1 fat choice = 0 g carbohydrate, 0 g protein, 5 g fat, and 45 kcal.

Note: In general, one fat exchange is 1 teaspoon of regular margarine, vegetable oil, or butter; 1 tablespoon of regular salad dressing.

When used in large amounts peanut butter is counted as high-fat meat choices (see Meat and Meat Substitutes list).

Monounsaturated Fats		Serving Size
Avocado		Tbsp. (1 oz.)
Nut butters (trans fat-free): almond butter, cashew butter, peanut butter (smooth or crunchy)		$1^1/_2$ tsp
Nuts	almonds	6 nuts
	cashews	6 nuts
	hazelnuts	5 nuts
	peanuts	10 nuts
	pistachios	16 nuts
Oils: canola, olive, peanut….		1 tsp
Olives	black	8 large
	green,	10 large
Polyunsaturated Fats		Serving Size
Margarine		1 Tbsp.
Mayonnaise - regular		1 tsp
Nuts	pine nuts	1 Tbsp.
	walnuts	4 halves
Oil: corn, cottonseed, flaxseed, grape seed, safflower, soybean, sunflower		1 tsp
Seeds : flaxseed, whole , pumpkin, sunflower, sesame seeds		1 Tbsp.
Tahini or sesame paste		2 tsp
Saturated Fats		Serving Size
Butter		1 Tbsp.
Coconut milk		$1^1/_2$ Tbsp.
Cream whipped		2 Tbsp.
Cream cheese		1 Tbsp. (1/2 oz)
Oils:		1 tsp

III) Household and metric measures

1 teaspoon (tsp) = 5 ml, 1 tablespoon (Tsp) = 15 ml, 1 cup (c) = 240 ml .

1 fluid ounce (fl oz) = 30 ml, 1 ounce (oz) = 28 gm**,** 2.2 pound (Ibs) = 1 kg

1 Fist = 1 cup or 1 serving of vegetables

Palm without fingers = 3-4 oz., 1 serving of protein

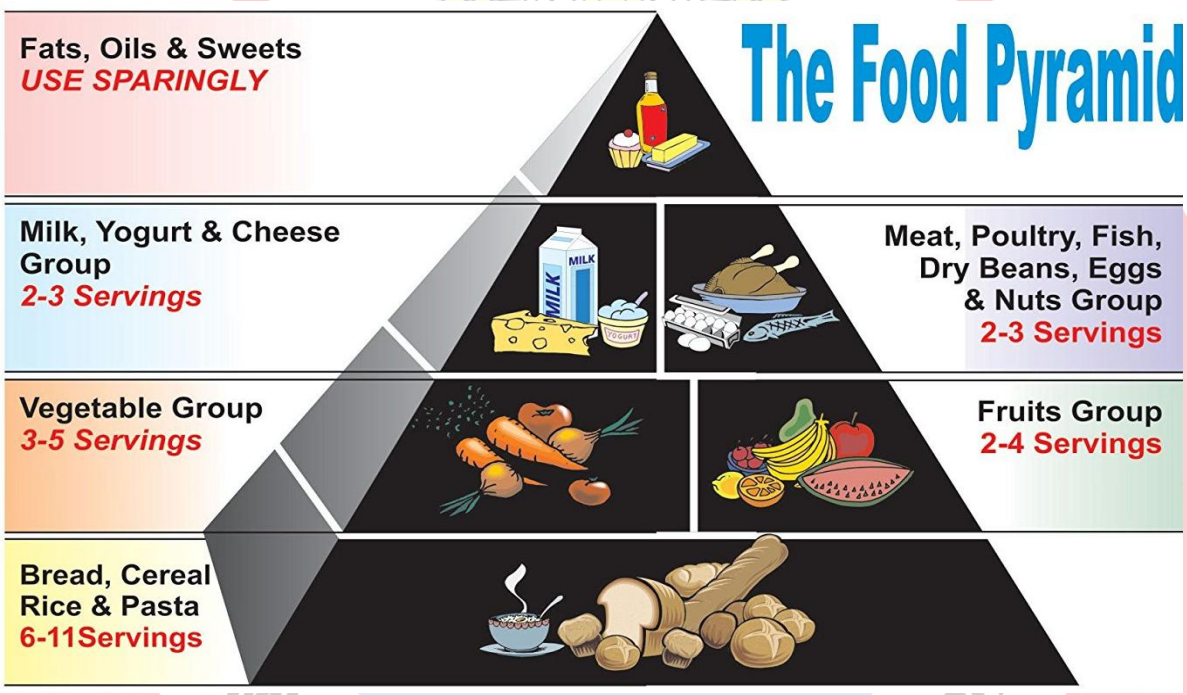
1 cupped palm = ½ cup of a fruit or starch, potato, beans, rice, etc.

Full Thumb = 1 ounce or 1 serving of solid fats like cheese, avocado, nuts

Tip of Thumb = 1 tsp. or 1 serving of liquid fats like, oil, butter, mayonnaise

FOOD EXCHANGE SYSTEM &FOOD GUIDE PYRAMID

The Food Guide Pyramid is based on the food group system with some slight modifications. It has six food groups.



- It recommends eating a variety of foods to get the required nutrients and also the right amount of energy to maintain a healthy body weight.

- It can be used as a flexible system of making healthy food choices.

- It is better to choose the lowest fat choices from each food group.

- No specific serving size is given for fats, oils and sweets because the message is to eat them SPARINGLY

Planning a Healthy Diet

To obtain a daily variety of foods that provide healthful amounts of carbohydrate, protein, and fat, as well as vitamins, minerals, and fiber, the meal plan for adults and teenagers should include at least:

• 2 to 3 servings of non-starchy vegetables

• 2 servings of fruits

• 6 servings of grains (at least 3 of whole grains), beans, and starchy

Vegetables

• 2 servings of low-fat or fat-free milk

• About 6 ounces of meat or meat substitutes

• Small amounts of fat and sugar

The actual amounts are determined by age, gender, activity levels, and other factors

That influence energy needs.

Case study: About how to use Food Exchange System

Design dietary regimen for a person require 2200 kcal / day

1) Energy Distribution –

- - 55% of energy from carbohydrates.
- - 20% of energy from protein.
- - 25% of energy from fat.

2) Determine the total amount of carbohydrate, protein and fat.

- CHO (calories) = 2200 X 55 / 100 CHO = 1210 Kcal
- CHO (grams)=1210/4 = 302.5g

CHO= 302 g

- Protein (cal)=2200 X 20 / 100 Protein = 440 Kcal.
- Protein (grams) =440/4=110 g

Protein = 110 g

- Fat (calories)=2200 X 25 / 100.
- Fat (cal) = 550 Kcal.
- Fat (grams) = 550/9 = 61g

Fat =61 g

3) Distribution of total energy carbohydrate, protein and fat by using Exchange List.

Food Groups		Total calories	Number of Exchanges CHO	Number of Exchanges PRO	Number of Exchanges FAT
Starch List		12 × 80 = 960 Kcal	12 × 15 = 180 g	12 × 3 = 36 g	12 × 0-1 = 0 g
Fruit- COH List		5 × 60 = 420 Kcal	5 × 15 = 75 g	-------- × 0 = g	---
Milk List	Whole	2 × 150 = 300 Kcal	2 × 12 = 24 g	2 × 8 = 16 g	2 × 8 = 16 g
Non-starchy Vegetables		4 × 25 = 100 Kcal	4 × 5 = 20 g	4 × 2 = 8 g	-------- × 0 = g
Meat list	Medium-fat	6 × 75 = 450 Kcal	-------- × 0 = g	6 × 7 = 42 g	6 × 5 = 30 g
Fat group		3 × 45 = 135 Kcal	-------- × 0 = g	-------- × 0 = g	3 × 5 = 15 g
Total		2245	299	102	61
Recommended		2200	302	110	61

4) Converting the exchanges into meals

Total amount of food exchanges	Meal planning				
	Breakfast	Morning snack	Lunch	After lunch snack	Dinner 25 % of total energy
	30% of total energy		45 % of total energy		
12 Starch exchange 5 Fruit exchange 2 Whole milk exchange 4 Non-starchy Vegetables exchange 6 Medium fat meat exchange 3 Fat exchange	3 Starch exchange 1 Whole milk exchange 2 Medium fat meat exchange	1 Fruit exchange CHO 1 Fat	6 Starch exchange 2 Fruit exchange 2 Non-starchy Vegetables exchange 2 Medium fat meat exchange 1 Fat	1 Fruit exchange	3 Starch exchange 1 Whole milk exchange 2 Non-starchy Vegetables exchange 2 Medium fat meat exchange 1 Fat exchange 1 Fruit exchange
	- Brad white 3 slice (3 oz) - 1 cup of whole milk - Feta cheese 1 oz + 1 egg boiled	5 Cookies Wafer 1oz	Rice 1 cup Fried Potato 3 oz + 1 fat chicken 2 oz Cucumber + tomato Apple 2 small	Cup of tea + 2tep sugar	Brad white 3 slice (3 oz) Yogurt 2/3 cup Cucumber + tomato Processed cheese 2 Oz Ice cream light 1/2 cup

Solved Exercise:

Calculate the energy requirements and meal planning for the following patient: 45 years old lady Wt. 83 kg, Ht: 5 feet 3 inches, Rest circumference: 16 cm, Activity: Sedentary, Medical diagnosis: Recently diagnosed DM type 2.

Note: Use the Food Exchange List.

I) Energy Calculation

1- Determine BMI BMI = Wt. (kg) / Hot (m^2)

Ht = 5 feet 3 in = (5×30.5) + 3 × 2.54 = 152.5 + 7.62 = 160 cm

BMI = 83 / $(1.6)^2$ = 32.4 kg/m^2 (obesity grade I)

2- Determine Ideal Body Weight using Hamwi Formula

Women IBW = 100 lbs. for first 5 feet in height + 5 lbs. for each inch over 5 feet

= 100 lbs + 5 lbs × 3 inch = 115 lbs

IBW = 115 lbs / 2.2 = 52.2 kg

3- Frame Size Calculation

Frame size (r) = Height (cm) / Wrist circumference (cm)

r = 160 / 16 = 10 Medium frame

4- Calculate Percent of IBW

Percent of IBW = (Actual Weight / IBW) × 100

= (83 / 52.2) × 100 = 159 %

5- Since the patient's wt is 159 % IBW grad I obesity ,we will use adjusted body weight (ABW) to calculation total energy expenditure EER.

Adjusted body weight = ideal weight + 0.25 (actual weight - ideal weight)

= 52.2 + 0.25 (83 – 52.2) = 60 kg

ABW = 60 kg which used in calculating energy

6- Calculation total Energy Requirements EER

Total Energy Requirements = (Resting Energy Expenditure REE× Physical Activity Factor PA) + Thermic effect of foods.

a) Estimating Resting Energy Expenditure (REE) by **Harris-Benedict equation**

REE = 655.1 + [9. 6 x Wight (kg)] + [1.8 x height (cm)] – [4.7 x age (years)]

REE = 655.1 + [9. 6 x 60] + [1.8 x 160] – [4.7 x 45]

REE= 655.1 + 576 + 288– 211 = 1308 kcal.

b) Physical Activity for Sedentary = 1

c) Thermic effect of foods = (REE × PA) 10/100

= (1308 × 1) 10 / 100 = 130 kcal

Total Energy Requirements= 1308 +130 = 1438 kcal

II) Meal Planning

1) Energy Distribution –

- - 55% of energy from carbohydrates.
- - 20% of energy from protein.
- - 25% of energy from fat.

2) Determine the total amount of carbohydrate, protein and fat.

- CHO (calories) = 1438 × 55 / 100
- CHO= 790 Kcal
- CHO (grams)=790/4 = 199g

CHO= 199 g

- Protein (cal) =1438 × 20 / 100 Protein = 288 Kcal.
- Protein (grams) =288/4=72 g

Protein = 72 g

- Fat (calories) = 1438 × 25 / 100. Fat (cal) = 360 Kcal.
- Fat (grams) = 360/9 = 40

Fat =40 g

3) Distribution of total energy carbohydrate, protein and fat by using Exchange List.

Food Groups		Total calories	Number of Exchanges CHO	Number of Exchanges PRO	Number of Exchanges FAT
Starch List		7 × 80 = 560 Kcal	7 × 15 = 105 g	7 × 3 = 21 g	7 × 0.5 = 3.5 g
Fruit- COH List		3 × 60 = 180 Kcal	3 × 15 = 45 g	0	---
Milk List	Low fat	2 × 120 = 240 Kcal	3 × 12 = 24 g	2 × 8 = 16 g	3 × 5 = 10 g
Non-starchy Vegetables		3 × 25 = 75 Kcal	3 × 5 = 15 g	3 × 2 = 6 g	0
Meat list	Very lean	1 × 35 = 35 Kcal	0	1 × 7 = 7 g	0
	Medium-fat	3 × 75 = 225 Kcal	0	3 × 7 = 21 g	3 × 5 = 15 g
Fat group		3 × 45 = 135 Kcal	0	0	3 × 5 = 15 g
Total		1450	189	71	43.5
Recommended		1438	199	72	40

4) Converting the exchanges into meals

Total amount of food exchanges	Meal planning					
	Breakfast	Morning snack	Lunch	After lunch snack	Dinner	Bed time snack
	30% of total energy		40 % of total energy		30 % of total energy	
7 Starches ex. 3 Fruit ex. 2 Low fat milk ex. 3 Non-starchy Vegetables ex. 1 Very lean meat 3 Medium fat meats ex. 3 Fat ex.	2 Starches ex. (1 very lean meat ex + 1Fruit CHO ex.) 1 Fat ex 1 Non-starchy Vegetables ex	1 low milk ex.	3 Starches ex. 1 Fruit ex. 1 Non-starchy Vegetable ex. 2 Medium fat meats ex. 2 Fat	1 Fruit ex.	2 Starches ex. . . . 1 Non-starchy Vegetable ex. 1 Medium fat meat	1 low milk ex
	Brad whole grain (2 oz) - Bean cooked 1/2 cup - 1 tsp oil Cucumber 4 oz	1 cup of reduced milk	Pasta cooked 1 cup chicken 2 oz squash cooked 3 oz green rocket 1 oz Apple 1 small 1 tsp oil for cooking	Apple 1 small	Brad whole grain (2 oz) Cucumber + tomato 1 Egg boiled	Yogurt 2/3 cup reduced fat

Low glycemic index foods and those rich in soluble fiber are recommended "see table of GI ".

Recommendations about diabetic diet planning "Carbohydrate issues"

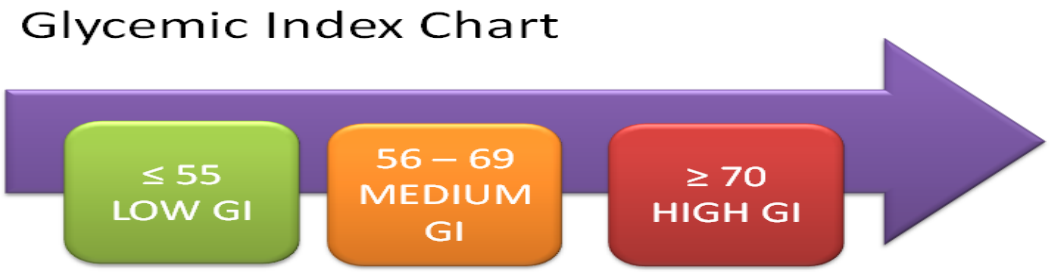
- The **glycemic response** refers to how quickly glucose is absorbed after a person eats, how high blood glucose rises, and how quickly it returns to normal.
- Slow absorption, a modest rise in blood glucose, and a smooth return to normal are desirable (a low glycemic response). Fast absorption, a surge in blood glucose, and an overreaction that plunges glucose below normal are less desirable (a high glycemic response).
- Different foods have different effects on blood glucose. The rate of glucose absorption is particularly important to people with diabetes, which may benefit from limiting foods that produce too great a rise, or too sudden a fall, in blood glucose.
- Glycemic index, a method of classifying foods according to their potential to raise blood glucose.
- Some studies have shown that selecting foods with a low glycemic index is a practical way to improve glucose control. Lowering the glycemic index of the diet may improve blood lipids and reduce the risk of heart disease as well. A low glycemic diet may also help with weight management.

Glycemic index of foods (Glucose e = 100)

Items	Glycemic index GI
White wheat bread	70
Whole wheat bread	52
Barley breads	34
Bread (80% barley-20% white-whea flour)	40
Rice	80
Pasta	50
Cornflakes	77
Vegetables	
Carrots	50
Peas(green)	54
Potato	65
Sweet Potato	48
Pumpkin	75
Eggplant	19
Broccoli	15
Green leafy vegetables Lettuce , celery	15
Cucumber	15
Spinach	15

Tomato	15
Legumes	
Chickpeas	33
Kidney beans	27
Lentils	28
beans	30
Fruit	
Apple	36
Apricot	43
Banana	60
Cherries	23
Grapefruit	25
Grapes	59
Kiwifruit	53
Mango	60
Orange	31
Peach	28
Pear	36
Pineapple	66
Plum	24
Raisins	64
Watermelon	72
Figs	61
Dairy Foods	
Milk whole	27
Yoghurt	23
Honey	58
Glucose	100
Maltose	105
Fructose	20
Sucrose	59

Low GI foods maybe those below 55, Moderate between 55 and 70; and High more than 70;



Food Composition Table

Food composition tables are used to calculate people's nutrient intakes. The values for nutrient and non-nutrient constituents are based on chemical analyses of 100 g of edible portion

Basic components

• Moisture

• Energy

• Protein, fat, and carbohydrate

•Vitamins, minerals and trace elements

1. All food items in food composition table calculated as raw except that are cooked before analysis.
2. All grains increased after cooking by twice as raw
3. All legumes increased after cooking by three times as raw

Effect of cooking on vitamins

- Vitamin A loss about 10 % by cooking.
- Thiamine loss about 20 % by cooking
- Vitamin C loss about 50 % by cooking

Food composition tables are used in meal paling and analysis of 24 hour recall as well as provide detailed information on the of food's nutrient values.

Food Composition Tableof100 g of edible portion- NNI 2006

Food items	Ref %	Water g	Energy kcal.	Protein g	Fat g	COH g	Fiber g	Na mg	K mg	Ca mg	Pho4 mg	Mg mg	Iron mg	Zinc mg	Vit A µg RE	Vit C mg	Vit.B1 mg	Vit.B2 mg
Macaroni	0	9.9	361	12	1.1	75.8	0.4	10	176	35	128	22	1.4	1.65	0	0	0.17	0.05
Corn flakes	0	5	373	6.2	2.1	82.3	2	646	139	15	44	11	1.4	1	0	0	0.5	0.09
Rice	0	12.5	351	7.3	0.7	78.8	0.7	11	93	30	98	23	0.7	1	0	0	0.1	0.03
Semolina	0	11	360	12	1.8	74	0.4	5	208	26	114	10	2	1.9	0	0	0.2	0.1
Corn starch	0	5	380	0.2	0.1	94.5	0	5	7	0	30	0	0	0	0	0	0	0
Wheat, grains	0	12.1	344	12	1.6	70.3	2.4	10	315	35	412	88	3.1	2.9	0	0	0.6	0.12
Wheat flour white	0	11.8	354	10	1	76.3	0.5	6	120	18	92	22	0.85	1.5	0	0	0.11	0.05
couscous	0	47	213	5.8	0.7	45.8	0.3	4	62	17	0	0	0.4	0.6	0	0	0	0
Bread Baladi	0	35.3	254	8.8	1	52.5	1.3	338	236	42	134	14	2.9	1.7	0	0	0.29	0.1
Bread white	0	33	270	8.4	1.5	55.6	0.5	400	152	30	0	0	1	0.9	0	0	0.18	0.05
Beans, broad	0	10.3	326	24.1	1.5	54	6.9	35	724	85	386	148	5.8	3.14	9	5	0.48	0.28
Beans, kidney	0	11.6	323	23.1	1.3	54.8	5.8	20	1309	120	374	136	6.5	2	0	0	0.6	0.2
chickpeas	0	8.6	352	20.3	4.2	58.3	5.3	50	962	127	352	122	6.7	4.7	10	4	0.41	0.29
Chickpeas yellow	0	10.5	354	19.6	4.4	59	3.4	34	855	155	340	130	5.8	3.4	19	2	0.48	0.21
Lentils unpeeled	0	10	340	22.4	1.1	60	3.8	30	725	47	327	86	7.3	4.2	12	0	0.4	0.22
Lentils peeled yellow	0	11.5	340	22.9	0.7	60.5	2.3	41	765	50	330	82	6.8	3.2	15	0	0.4	0.18

Food Composition Tableof100 g of edible portion- NNI 2006

Food items	Ref %	Water g	Energy kcal.	Protein g	Fat g	COH g	Fiber g	Na mg	K mg	Ca mg	Pho4 mg	Mg mg	Iron mg	Zinc mg	Vit A µg RE	Vit C mg	Thiamine mg	Riboflavin mg
lupines	0	8	355	38	9	30.5	11	94	605	279	490	189	5.8	2.8	0	0	0.41	0.48
peas	0	10	345	22.1	2.1	59.4	3.9	32	928	82	352	125	5.8	3.1	34	4	0.84	0.25
Almonds	0	4.6	640	17.6	55.8	16.8	2.5	7	793	215	485	230	4.5	3.2	21	0	0.26	0.72
Coconuts dry	0	3	689	6	65	20	4	23	560	20	176	44	2.9	1.5	0	0	0.07	0.04
Hazelnuts	0	5	633	18.6	55.7	14.4	3.7	5	600	180	300	130	3.5	2	24	0	0.45	0.25
peanuts	30	4.6	585	26.4	44.9	18.8	2.9	4	670	55	380	180	2.5	2.6	84	0	0.85	0.14
Pistachio nuts	44	5.5	631	20.9	54.1	15.1	1.8	15	850	122	503	150	6.9	1.9	54	0	0.7	0.2
Pumpkin seed / salted	23	4.3	591	23.9	48	15.8	4.5	695	790	55	1027	0	9.5	5.5	21	0	0.3	0.9
Sesame seed	0	4.6	600	19	54.8	14.5	5.5	65	506	887	515	174	10.2	8.6	9	0	1.1	0.32
walnuts	0	3.4	695	14.7	64.9	13	2.2	5	600	75	390	120	2	2.8	7	5	0.35	0.12
Artichokes	52	85.8	45	3.5	0.2	7.4	2	32	350	55	96	30	0.9	0.5	15	11	0.07	0.06
Bean green	12	91	30	1.8	0.2	5.2	1.1	8	274	35	45	12	1.7	0.5	57	18	0.09	0.12
Broccoli	20	88.2	38	3.5	0.3	5.4	1.5	35	368	57	80	20	1.2	0.8	0.09	150	0.1	0.24
cabbage	25	91	27	1.3	0.2	5	1.2	35	250	40	32	15	0.58	0.3	5	35	0.07	0.06
Carrots	5	89.4	36	1.2	0.2	7.4	1	62	300	40	42	18	0.5	0.4	1871	8	0.06	0.04

Food Composition Tableof100 g of edible portion- NNI 2006

Food items	Ref %	Water g	Energy kcal.	Protein g	Fat g	COH g	Fiber g	Na mg	K mg	Ca mg	Pho4 mg	Mg mg	Iron mg	Zinc mg	Vit A µg RE	Vit C mg	Thiamine mg	Riboflavin mg
Colocasia	23	79	77	2.1	0.2	16.6	0.8	14	495	62	60	13	1	0.5	11	6	0.15	0.05
Cauliflower	28	91.5	28	2.3	0.3	4.1	1	15	304	30	56	20	0.5	0.3	4	58	0.05	0.06
Celery	33	85.2	52	0.9	0.2	11.7	0.7	74	315	40	48	25	0.95	0.21	15	7	0.04	0.05
Cucumber	10	95	16	0.7	0.1	3.1	0.6	5	130	18	31	8	0.6	0.2	4	9	0.04	0.05
Eggplant	16	91	28	1.7	0.2	4.9	1.2	7	272	15	25	13	0.5	0.3	8	6	0.04	0.03
Garden rocket	25	89	32	2.5	0.5	4.4	1	33	257	127	40	13	8.3	0.8	364	125	0.14	0.21
Jew's mallow	70	83	54	5	1	6.3	1.5	42	380	270	61	17	4.2	0.4	1150	80	0.5	0.32
Lettuce	46	95	16	1.1	0.3	2.1	0.7	7	125	28	22	10	1	0.15	181	10	0.05	0.07
Mushroom	0	90	31	2.5	0.1	5.1	0.5	10	346	6	120	11	0.6	0.7	0	2	0.1	0.4
Okra	20	86	47	2	0.2	9.3	1	11	210	98	74	25	1.9	0.5	13	20	0.1	0.12
Onion	40	86	49	1.1	0.2	10.7	0.9	10	224	125	50	8	1	0	60	18	0.04	0.05
Parsley	35	84	50	3.3	0.4	8.2	1.3	30	723	210	54	39	6.55	1.8	1272	156	0.12	0.32
Peas	60	75	89	6.2	0.4	15.1	2.1	3	286	20	122	19	1.7	1.2	55	25	0.32	0.18
Peppers	15	92	24	1.3	0.3	4.1	1.5	25	195	15	25	14	0.9	0.3	30	110	0.06	0.04
Pumpkin	35	91	26	1	0.1	5.2	1.1	2	310	25	33	15	0.7	0.2	330	7	0.04	0.06

Food Composition Tableof100 g of edible portion- NNI 2006

Food items	Ref %	Water g	Energy kcal.	Protein g	Fat g	COH g	Fiber g	Na mg	K mg	Ca mg	Pho4 mg	Mg mg	Iron mg	Zinc mg	Vit A µg RE	Vit C mg	Thiamine mg	Riboflavin mg
Potatoes	11	80	73	1.6	0.1	16.4	0.6	8	420	7	46	16	0.6	0.32	2	18	0.09	0.04
Sweet-potatoes	19	70	112	1.8	0.3	25.5	0.9	13	398	39	40	25	0.8	0.3	570	24	0.11	0.06
Radishes	28	91	27	1.4	0.1	5	1	18	292	56	27	12	0.8	0.17	0	30	0.02	0.04
Spinach	20	92	22	2.5	0.3	2.4	0.7	58	540	92	47	54	4.2	0.4	1058	32	0.11	0.19
Squash	15	92	24	1.3	0.2	4.2	0.8	6	200	25	31	12	0.5	0.1	12	12	0.04	0.09
Tomatoes	3	94	20	1.1	0.3	3.1	0.6	10	328	15	30	12	0.5	0.2	95	21	0.05	0.05
Apples	11	84	57	0.4	0.2	13.5	0.8	5	125	5	12	6	0.3	0	5	7	0.05	0.03
Apricots	10	84	58	0.9	0.4	12.7	0.7	3	304	15	25	11	0.5	0.2	265	12	0.04	0.06
Apricots dried	0	24	282	4.2	0.6	64.6	3.2	18	1615	86	120	40	5	0.6	590	2	0.01	0.18
Avocado	30	73	165	2.2	14	7.5	1.5	3	594	15	0	0	1	0.9	0	12	0.12	0.19
Banana	33	75	95	1.3	0.3	21.7	0.9	3	350	10	25	30	0.6	0.2	28	8	0.04	0.05
Mulberry	5	79	76	1.6	0.5	16.3	1.2	25	236	55	35	17	1.8	1.3	3	10	0.05	0.03
Dates	20	70	115	0.9	0.2	27.3	0.9	2	300	22	26	18	1.1	0.13	4	11	0.05	0.06
Dates dried	0	18	315	2.3	0.5	75.3	2.2	3	690	62	61	44	3.2	0.4	10	0	0.08	0.1
Figs	5	80.4	72	1.3	0.4	15.8	1.5	4	180	62	28	25	1	0.22	27	4	0.07	0.06

Food Composition Tableof100 g of edible portion- NNI 2006

Food items	Ref %	Water g	Energy kcal.	Protein g	Fat g	COH g	Fiber g	Na mg	K mg	Ca mg	Pho4 mg	Mg mg	Iron mg	Zinc mg	Vit A µg RE	Vit C mg	Thiamine mg	Riboflavin mg
Figs dry	0	20	293	4.1	1.1	66.6	5.7	13	901	130	80	65	3.53	0.9	0	0	0.12	0.11
Grapefruits	37	88	43	0.6	0.1	9.8	0.4	5	140	15	18	12	0.2	0.12	2	35	0.03	0.02
Grapes	0	80	77	0.6	0.6	17.2	0.7	5	242	17	22	9	0.36	0.09	3	5	0.07	0.03
Guavas	5	81	62	0.8	0.5	13.5	3.4	8	255	23	44	25	0.8	0.46	20	277	0.05	0.05
Kiwifruit	12	85	54	1.9	0.6	10.2	1.3	3	210	30	0	0	0.3	0.1	0	95	0.01	0.02
Lemons	38	91	32	0.8	0.2	6.7	0.6	4	165	32	14	12	0.5	0.15	4	75	0.05	0.03
Mandarin	31	86	48	0.7	0.2	10.8	0.9	7	147	39	22	16	0.5	0.4	13	26	0.09	0.03
Oranges	28	85	56	1.1	0.3	12.1	0.6	3	181	37	28	7	0.3	0.2	8	55	0.08	0.04
Mangos	43	81	68	0.8	0.3	15.5	1.1	10	200	15	17	8	0.5	0.18	250	30	0.04	0.04
Melons	28	91	30	0.8	0.2	6.3	0.6	8	270	10	14	8	0.4	0.2	18	22	0.05	0.03
Watermelons	48	92	26	0.4	0.1	5.9	0.4	2	90	6	11	7	0.4	0.4	6	5	0.03	0.04
Cantaloupe	42	90	33	0.8	0.1	7.3	0.4	18	280	15	18	20	0.5	0.1	219	23	0.05	0.04
Peach	11	86	51	0.7	0.2	11.7	0.7	3	280	15	22	11	0.8	0.2	43	12	0.02	0.04
Pears	22	83	58	0.3	0.2	13.7	1.3	5	144	10	12	10	0.4	0.14	2	20	0.03	0.05
Pineapple	46	85	55	0.5	0.2	12.7	0.5	3	219	15	12	16	0.5	0.22	8	15	0.1	0.05

Food Composition Tableof100 g of edible portion- NNI 2006

Food items	Ref %	Water g	Energy kcal.	Protein g	Fat g	COH g	Fiber g	Na mg	K mg	Ca mg	Pho4 mg	Mg mg	Iron mg	Zinc mg	Vit A µg RE	Vit C mg	Thiamine mg	Riboflavin mg
Plums	15	86.8	50	0.7	0.2	11.3	0.6	2	260	19	21	11	0.6	0.05	71	5	0.04	0.03
Pomegranate	40	80	68	0.7	0.4	15.5	2.1	5	280	15	30	8	0.3	0.14	2	16	0.08	0.06
Raisins	0	17	320	2.4	0.3	76.9	1.6	30	740	63	90	34	1.6	0.16	0	0	0.12	0.09
Strawberries	7	90	34	0.8	0.4	6.7	1.2	2	185	26	24	15	0.9	0.1	6	40	0.04	0.05
Beef meat	0	67.4	186	19.6	11.9	0.0	0.0	72	375	15	171	22	3.4	4.8	5	0	0.07	0.11
Veal meat	0	75	123	18.7	5.4	0	0	103	372	10	253	27	2	2.6	3	0	0.1	0.2
Beef liver	0	70	132	19.5	4	4.4	0	88	303	10	352	14	7.8	7.7	12121	25	0.26	3.1
Beef Basterma	0	58	156	29.9	4	0	0	1500	212	45	270	29	4	7	0	0	0	0
Beef sausage	0	50	312	15	24	9	0	810	175	35	172	16	1.4	1.6	0	0	0.05	0.11
Beef spleen	0	77	97	18	2.1	1.5	0	108	415	9	218	11	10.6	2.4	0	0	0.12	0.34
Camel meat	0	76	108	19	3.6	0	0	187	347	15	160	12	7.8	8.2	8	0	0.38	0.76
Goat meat	0	70	165	18.4	10.2	0	0	53	286	12	150	14	2.3	2.4	0	0	0.18	0.26
Lamb meat	0	62	249	16.5	20.3	0	0	65	300	15	163	15	2.5	2.7	9	0	0.12	0.19
Chicken meat	30	75	121	19	5	0	0	67	250	12	186	17	1.6	2.1	0	0	0	0
Chicken liver	0	73	122	17.6	4.6	2.5	0	45	166	20	240	13	10.5	3.5	7500	20	0.35	2.8

Food Composition Tableof100 g of edible portion- NNI 2006

Food items	Ref %	Water g	Energy kcal.	Protein g	Fat g	COH g	Fiber g	Na mg	K mg	Ca mg	Pho4 mg	Mg mg	Iron mg	Zinc mg	Vit A µg RE	Vit C mg	Thiamine mg	Riboflavin mg
Chicken luncheon	0	67	144	18	5.5	5.5	1.5	1003	300	20	0	0	1.06	0.9	0	0	0	0
Pigeon meat	25	59.6	251	20	19	0	0	58	275	27	276	20	2.2	2.4	0	0	0.1	0.18
Rabbit meat	36	72	133	20.7	5.6	0	0	72	345	15	234	30	1.6	1.6	5	0	0.08	0.16
Turkey meat	30	70	151	21	7.4	0	0	70	321	15	220	20	0.99	1.6	0	0	0.11	0.12
Egg chicken, whole	12	75	149	12.6	10.8	0.3	0	155	130	62	218	15	2.5	1.5	128	0	0.14	0.36
Egg chicken, white	0	88	46	11	0.1	0.2	0	172	133	10	22	10	0.15	0.03	0	0	0.02	0.21
Egg chicken, yolk	0	50	343	16.5	30.2	1.2	0	44	89	150	586	18	5	4	384	0	0.28	0.55
Herring smoked	35	62	200	20	12.9	0.9	0	1056	257	66	254	43	1.53	1.2	15	0	0.02	0.12
Mackerel canned	0	62	215	20	15	0.1	0	152	349	10	283	29	1.93	0.61	38	0	0.09	0.29
Tuna canned	0	54	267	24.6	18.5	0.4	0	450	285	10	189	31	2.7	0.4	28	0	0.04	0.1
Sardines	44	70	156	19.2	8.8	0.0	0	91	212	34	210	20	0.92	0.8	13	0	0.11	0.08
Mullet	47	73	133	19	6.3	0	0	88	280	21	208	18	1.3	1.5	24	1	0.07	0.15
Tilapia	44	77	94	19	2	0	0	85	280	92	197	32	1.9	0.8	25	0	0.08	0.15
Cheese, processed	0	46	324	19	25	5.7	0	1160	93	710	542	30	0.5	2.4	205	0	0.03	0.26
Cheese, white full cream	0	53	256	16.3	19.8	3.2	0	2769	115	456	273	45	0.2	1.9	166	0	0.08	0.37

Food Composition Tableof100 g of edible portion- NNI 2006

Food items	Ref %	Water g	Energy kcal.	Protein g	Fat g	COH g	Fiber g	Na mg	K mg	Ca mg	Pho4 mg	Mg mg	Iron mg	Zinc mg	Vit A µg RE	Vit C mg	Thiamine mg	Riboflavin mg
Cheese, white half cream	0	69	151	13	8.9	4.6	0	805	146	357	175	32	0.25	1.4	95	0	0.1	0.35
Fermented milk	0	87	62	3.8	3.2	4.5	0	51	144	122	90	10	0.05	0.31	38	0	0.23	1.03
Milk	0	82	102	4.2	7.1	5.4	0	52	142	180	86	17	0.2	0.22	22	3	0.1	0.35
Milk, half cream	0	89	48	3.4	1.5	5.1	0	52	153	128	88	17	0.05	0.4	23	0	0.08	0.2
Milk skimmed	0	89	41	3.5	0.6	5.3	0	50	143	126	95	16	0.05	0.4	0	0	0.1	0.21
Milk powder	0	2.7	497	26.7	26.2	38.7	0	350	1450	930	850	105	0.4	3.53	353	10	0.4	1.4
Yoghurt	0	87	64	3.4	3.2	5.5	0	62	180	168	101	16	0.2	0.2	30	0	0.06	0.18
Yoghurt, low fat	0	87	50	4	0.9	6.4	0	60	185	170	105	14	0.2	0.22	0	0	0.07	0.19
Yoghurt, fruits	0	82	68	3	1.2	11.2	0	85	199	162	140	15	0.25	0.7	9	3	0.08	0.23
Butter	0	16	742	0.7	82	0.3	0	10	25	15	23	2	0.16	0.15	727	0	0	0
Oils " Vegetable "	0	0	899	0	99.9	0	0	0	0	0	0	0	0	0	0	0	0	0
Mayonnaise	0	14	722	1.3	77.4	5.1	0	650	45	20	52	0	0.5	0.4	80	0	0.05	0.1
Olives blacks pickled	20	69	158	1.5	12	10.9	1	905	137	158	0	0	1.5	0	30	0	0	0
Olives green pickled	20	82	88	1	8	2.9	1	899	150	105	0	0	1.4	0	23	0	0	0
Tomato pasta	0	78	78	3.8	0.4	14.8	0.5	807	514	25	83	28	3.1	0.5	285	15	0.19	0.11

Food Composition Tableof100 g of edible portion- NNI 2006

Food items	Ref %	Water g	Energy kcal.	Protein g	Fat g	COH g	Fiber g	Na mg	K mg	Ca mg	Pho4 mg	Mg mg	Iron mg	Zinc mg	Vit A µg RE	Vit C mg	Thiamine mg	Riboflavin mg
HalawaTehinia	0	2	520	11.2	27.5	57	1.2	22	95	42	386	20	3	2.2	0	0	0.42	0.12
Sesame Tehina	0	3	660	20	60	10	4	84	205	340	665	44	6.1	5.5	11	0	0.94	0.26
Honey	0	17	329	0.3	0	82	0	6	50	11	10	4	0.6	0.08	0	3	0.02	0.05
Jams	0	28	283	0.7	0.1	69.7	0.3	14	95	16	10	9	1.2	0.03	0	9	0.02	0.04
Jelly powder	0	1.8	390	10	0	87.4	0	325	0	0	0	0	0	0	0	0	0	0
Molasses	0	26	280	0	0	70	0	88	1400	29	0	0	5.7	0.68	0	0	0.07	0.13
Sugar sucrose	0	0.5	398	0.0	0.0	99.5	0	0	0	0	0	0	0	0	0	0	0	0
Sugar fructose	0	1	396	0	0	98.9	0	0	0	0	0	0	0	0	0	0	0	0
Carbo. Soft drinks	0	98	42	0	0	10.6	7	2	3	15	0	0	0	0	0	0	0	0
Juice 14% CHO	0	85	56	0.4	0	14	0	3	170	10	45	11	0.3	0.4	0	20	0.08	0.04
Taamia	0	32	355	10.9	20	32.6	1.5	524	258	24	118	41	2.7	1.16	0	6	0	0
Pop corn	0	1.8	451	9.1	16.7	66	2.5	706	158	20	293	0	1.8	1.5	0	0	0	0
Biscuit, plain	0	3.5	438	9.6	11.8	73.3	0.8	129	140	109	173	0	2	0.7	0	0	0.08	0.05
Biscuit, cream	0	2	515	6.3	25.4	65.2	0.6	93	150	45	83	0	1.5	0.5	0	0	0.09	0.08
Cup Cakes	0	26	379	7	18.4	46.3	0.3	350	83	58	100	0	0.5	0	53	0	0.02	0.08

"Renal Case " about how to use Food composition tables in meal planning.

Background:

1) Dietary Recommendations for Chronic Kidney Disease

Nutrient	Pre-Dialysis	On dialysis
Energy	30 -35 kcal/kg body weight (IBW or ABW_{EF})	
Protein	0.6 – 0.75 g/kg body weight (IBW or ABW_{EF}) - (≥ 50% HBV)	1.2–1.3 g/kg body weight (IBW or ABWEF) - (≥ 50% HBV)
Fat	As necessary to maintain a healthy lipid profile	
Fluid	Unrestricted if urine output is normal	1000 mL/day plus urine output
Sodium	1000–3000 mg/day	
Potassium	Unrestricted unless hyperkalemia is present	2000–3000 mg/day ; adjust according to serum potassium levels
Calcium	1000–1500 mg/day	≤ 2000 mg/day from diet and medications
Phosphorus	800–1000 mg/day: if serum phosphorus or parathyroid hormone is elevated	

- Adjusted oedema free body weight (ABW_{EF}) - High Biological Value proteins (HBV)

Food exchange list for sodium, potassium and phosphorus

Exchange Group / Lists		Serving Size	Sodium mEq	Potassium mEq	Phosphorus mg
CHO Group	Starch	One ex	varies 0.5 - 8	varies 1.5 – 4 – 7 - 12	45
	Fruits	One ex	Trace	varies 2-4-7	15
	Milk (high in phosphate)	Half One ex	2.5	4	115
	Non- starchy vegetables	One ex	varies 0.5 - 12	4-7	30
Meat and Meat Substitutes Group		One ex	varies 1 – 3 - 8	2.5	70
Fats Group		One ex	0-2	Trace	Trace

- Omits the dried beans legumes bran and whole grain items is necessary for optimal control

Na. Conversions

- 1 g sodium = 43.5 mmol sodium or mEq potassium
- 1 g salt (sodium chloride) = 390 mg sodium
- 1 tsp salt = 6 g salt ≈ 2,400 mg sodium = 104 mmol sodium = 104 mEq sodium

K. Conversions

- 1 g potassium = 25.6 mmol or mEq potassium

Adjusted oedema free body weight (ABW_{EF})

Used for energy and protein requirement calculation

Adjusted body weight (BW) = edema-free BW + [(standard BW - edema-free BW) × 0.25]

Adjust when patient's weight is <95% or >115% of standard body weight.

Categorisation of patients based on their current weight status

Usual weight < 90 % of medium standard weight		Ideal Body Weight
Normal weight	90-115 % of medium standard weight	Actual oedema free
Over weight	> 115 % of medium standard weigh t	Adjusted oedema free body

How to Leach Potassium from Vegetables

For potatoes, sweet potatoes, carrots and beets

1. Peel and place the vegetables in cold water.
2. Slice vegetable $\frac{1}{8}$ inch thick.
3. Rinse in warm water for a few seconds.
4. Soak for a minimum of two hours in warm water. Use ten times the amount of water to the amount of vegetables
5. Rinse under warm water again for a few seconds.
6. Cook vegetable with five times the amount of water as the amount of vegetable.

Case Study

57 year old male admitted in hospital at MMW has a history of HTN and recurrent UTI "urinary tract infection" Recently he has been feeling more fatigued and has an additional loss of appetite and experiencing nausea. His diagnosis has been confirmed as Chronic Renal Failure (CRF) Pre-Dialysis. Laboratory tests revealed elevated serum creatinine, BUN, potassium levels and phosphate level. He is 5 feet 10 inches tall , weighs 172 pounds, medium Frame size . The patient needs to follow a conservative diet To:

- Minimize uremia, retard progression of CRF
- Preserve body protein stores until renal function returns to normal
- Prevent nutritional deficiencies

I)Dietary History

- Not on any special diet
- Usually 3 main meals, coffee in the evening and fruit juice at mid-morning.
- Likes fruit juice
- Dislikes fish
- No known food allergy
- Usual water intake: 1.5 - 2 lit/day
- Canned/preserved foods: Occasional

II)24 Hour Diet Recall before admission

- **Breakfast**
  1 Cup whole milk sweetened with 2 tsp sugar
  100 g one loaf baladi bread
  1 boiled egg
  Feta Cheese 1 Oz
- **Mid-morning** 1 Cup fruit juice
- **Lunch**
  Macaroni 2 cups (+ 1 tsp corn oil for cooking + 1 tsp tomato pasta)
  Roast beef (medium) 1 pc (2 oz.)
  Squash 1 Cup (+ 1 tsp corn oil)
  Salad greens 1 cup (2 Oz tomato + 2 Oz cucumber)
  ½ tsp salt added during cooking

- **At Evening** - Black coffee 1 cup (+ 2 tsp sugar)
- **Dinner**

  Broad beans 1 cup (+ ½ tsp salt added + Tehineh 1 tsp + 1 tsp corn oil)

  Yoghurt whole milk 3/4 Cup

  100 g one loaf baladi bread

III) Nutritive value of diet recall

- Total energy consumed: 2048 Kcal = 2100 kcal.
- CHO : 289 gm
  % CHO from total energy = [(289 × 4) / 2100] × 100 = 55 %

- Protein 79 gm More than patent's needs
  High Biological Value protein (HBV) 39 gm
  % Protein from total energy = [(79 × 4) / 2100] × 100 = 15.4 %

- Total fat 63.4 gm
- Saturated fat 41 gm
  % Fat from total energy = [(63.4 × 9) / 2100] × 100 = 27.1 %.

- Na 4395 mg = 191 meq (High sodium intake)
- K 3028 mg = 77.5 meq

Analysis of the 24 Hour Diet Recall before admission by using Food composition tables

Food items	Amount (g)	Energy kcal.	Protein(g)		Fat (g)		COH (g)	Fiber (g)	Na mg	K mg	Ca mg	Pho4 mg	Mg mg	Iron mg	Zinc mg	Vit A µg RE	Vit C mg	Vit.B1 mg	Vit B2 mg
			Ani	Pla	Ani	Pla													
Macaroni	100	361		12		1.1	75.8	0.4	10	176	35	128	22	1.4	1.65	0	0	0.17	0.05
Bread Baladi	200	508		17.6		2	105	2.6	676	472	84	268	28	5.8	3.4	0	0	0.58	0.2
Beans, broad	30	97.8		7.23		0.45	16.2	2.07	10.5	217.2	25.5	115.8	44.4	1.74	0.942	2.7	1.5	0.144	0.084
Cucumber	60	9.6		0.42		0.06	1.86	0.36	3	78	10.8	18.6	4.8	0.36	0.12	2.4	5.4	0.024	0.03
Squash	120	28.8				0.24	5.04	0.96	7.2	240	30	37.2	14.4	0.6	0.12	14.4	14.4	0.048	0.108
Tomatoes	60	12		0.66		0.18	1.86	0.36	6	196.8	9	18	7.2	0.3	0.12	57	12.6	0.03	0.03
Beef meat	60	111.6	11.8		7.14		0	0	43.2	225	9	102.6	13.2	2.04	2.88	3	0	0.042	0.066
Egg chicken, whole	50	74.5	6.3		5.4		0.15	0	77.5	65	31	109	7.5	1.25	0.75	64	0	0.07	0.18
Milk, whole	30	76.8	4.89		5.94		0.96	0	830.7	34.5	136.8	81.9	13.5	0.06	0.57	49.8	0	0.024	0.111
Cheese, full cream	240	244.8	10.1		17		12.96	0	124.8	340.8	432	206.4	40.8	0.48	0.53	52.8	7.2	0.24	0.84
Yoghurt	180	115.2	6.1		5.8	0	9.9	0	111.6	324	302.4	181.8	28.8	0.36	0.36	54	0	0.108	0.324
Oils " Vegetable "	15	134.85	0			15	0	0	0	0	0	0	0	0	0	0	0	0	0
Tomato pasta	60	7.8		0.38		0.04	1.48	0.3	80.7	51.4	15	49.8	16.8	1.86	0.3	171	9	0.114	0.066
Sesame Tehina	5	33		1		3	0.5	0.2	4.2	10.25	17	33.25	2.2	0.305	0.275	0.55	0	0.047	0.013
Sugar sucrose	30	119.4	0			0	29.85	0	0	0	0	0	0	0	0	0	0	0	0
Juice 14% CHO	200	112		0.8		0	28	0	6	340	20	90	22	0.6	0.8	0	40	0.16	0.08
Table Salt Nacl	6								2400										
Total		2048	39	40	41.2	22.2	289	7.25	4395	2977	1158	1440	265	17.2	12.8	472	90.1	1.801	2.18
			79		63.4														

RDA	2170	53	60	354	30	2000	4700	1200	900	420	8	11	900	90	1.2	1.3
% of RDA	94 %	158 %	105 %	81 %	24 %	239 %			160							

IV)Energy , Protein and Fat calculation :

Male Patient is 5 feet 10 inches tall , weighs 169 pounds and frame size (r) < 10.1

- Determine BMI

BMI = Wt (kg) / Ht (m^2)

Ht = 5 feet 10in = (5×30.5) + (10 × 2.54) = 152.5 + 25.4 = 178 cm

Wt = 172 pounds = 172 / 2.2 = 78 kg

BMI = 78 / $(1.78)^2$ = 24.6 kg/m^2 (normal wt.)

- Determine Ideal Body Weight (IBW) using Hamwi Formula

Men IBW = 106 lbs. for first 5 feet in height + 6 lbs. for each inch over 5 feet.

= 106 lbs + 6 lbs × 10 inch = 166 lbs

IBW = 166 lbs / 2.2 = 75 kg - Medium Frame size r = 10.1-11.0

Percent of IBW % = (Actual Weight / IBW) × 100

% IBW = (78 / 75) × 100 = 104 % Normal weight 90-115 % of medium standard weight
So, patient is Actual oedema free

Total energy requirement: according to National Kidney Foundation = 30 to 35 kcal/kg body weight (IBW or ABW_{EF})

For Hospital Patients Estimating Energy Requirements (EER)

Total Energy Requirements = [(REE × PA In ambulatory patients) + Thermic effect of foods] × appropriate stress factor

REE by *Harris-Benedict equation*
Men: REE = 66.5 + [13.8 x Wight (kg)] + [5 x height (cm)] – [6.8 x age (years)]
REE = 66.5 + [13.8 x 78] + [5 x 178] – [6.8 x 57]

REE = 66.5 +1076 + 890 – 388 = 1644 kcal.

Physical Activity " sedentary "= 1

Thermic effect of foods = (REE × PA) 10 / 100

Thermic effect of foods = (1644 × 1) 10 / 100 =164 kcal

Infected stress factor = 1.2

Total Energy Requirements = [(1644 × 1) + 164] × 1.2

Total Energy Requirements = 2170 kcal

Protein:

Protein requirement according to National Kidney Foundation

0.6 – 0.75 gm/kg body weight (IBW or ABW_{EF}) - (≥ 50% HBV)

Protein = 0.6 to 0.75 gm × 78 kg = 46.8 to 58.5 gm

Protein = (46.8 to 58.5) / 2 = 53 gm / day. at least 26 gm should be HBV.

Energy derived from protein = 53 × 4 = 212 kcal

Fat:

According to National Kidney Foundation fat needed as necessary to maintain a healthy lipid profile

NCEP step II " National Cholesterol Education Program's Step II"

Total Fat ≤ 30 % of total calories

Saturated Fat < 7 % of total calories

Unsaturated fat Total fat – saturated fat (MUFA: Up to 15 % energy & PUFA: Up to 10 % energy)

Fat (calories) = 2170 × 25 / 100 = 542 Kcal.

Fat (gm) = 542 / 9 = 60 gm / day

Carbohydrates :

CHO = Total Energy – (Energy derived from protein + Energy derived from Lipid)

CHO = 2170 – (212 + 542) = 1416 kcal.

CHO (gm) = 1416 / 4 = 354 gm / day

V)Meal Planning:

Total energy requirement 2170 kcal / day

Protein = 53 gm / day. at least 26 gm should be HBV.

Fat (gm) = 60 gm / day

CHO (gm) = 354 gm / day

Na : 1000 – 3000 mg / day

K :2000 – 3000 mg / day

Phosphate : 800–1000 mg/day

Distribution of total energy carbohydrate, protein and fat by using Exchange List.

Food Groups		Total calories	Number of Exchanges CHO	Number of Exchanges PRO	Number of Exchanges FAT
Starch List		9 × 80 = 720 Kcal	9 × 15 = 135 g	9 × 2 = 18 g	9 × 0.5 = 4.5 g
Fruit- COH List		10 × 60 = 600 Kcal	10 × 15 = 150 g	0	0
Milk " full cream "		1 × 150 = 150 Kcal	1 × 12 = 12 g	1 × 8 = 8 g	1 × 8 = 10 g
Non-starchy Vegetables		4 × 25 = 100 Kcal	4 × 5 = 20 g	4 × 2 = 8 g	0
Meat list	Very lean	1 × 35 = 35 Kcal	0	1 × 7 = 7 g	0
	Medium-fat	2 × 75 = 150 Kcal	0	2 × 7 = 14 g	2 × 5 = 10 g
Fat group		8 × 45 = 360 Kcal	0	0	8 × 5 = 40 g
Total		2115	360	55	62.5
Recommended		2170	354	53	60

Converting the exchanges into meals

Total amount of food exchanges	Meal planning					
	Breakfast	Morning snack	Lunch	After lunch snack	Dinner	Bed Time Snack
	30% of total energy		45 % of total energy		25 % of total energy	
9 Starch ex. 10 Fruit ex. 1 Whole milk ex. 4 Non-Starchy Vegetables ex. 1 Very lean meat ex. 2 Medium fat meat ex. 8 Fat ex.	3 Starch ex. ½ Whole milk ex. ½ Very lean meat ex 1 Fruit ex. CHO 1 Non-Starchy Vegetables ex. 2 Fat ex.	2 Fruit ex. CHO 1 Fat ex.	4 Starch ex. 2 ½ Non-starchy Vegetables ex. 1 Medium fat meat ex. 3 Fat ex. 2 Fruit ex	2 Fruit ex.	2 Starch exchange ½ Very lean meat ex. 1 Medium fat meat ex ½ Non-starchy Vegetables ex. 2 Fruit ex. CHO 2 Fat ex.	½ Whole milk ex. 1 Fruit ex. CHO
	- Brad white 1 slice 1 oz - [1 cup 6 Oz boiled mashed potato + 2 tsp oil + 1 boiled egg white] - [½ cup of sweetened whole milk 4 Oz + 2 tsp sugar] - Cucumber 4Oz	White angel cake 2 Oz	- Boiled rice 1 cup + 1 tsp oil for cooking - Fried chicken Finger [1 Oz boiled chicken + boiled mashed potato + 1 tsp oil for frying] Suttee [2 Oz Carrot + 4 Oz Squash + 1 tsp oil]. - Cucumber 2Oz Apple 2 small	½ cup Sweetened Boiled peach [1 peach 6 Oz + 2 tsp sugar]	- Brad white 1 slice 1 oz - Feta cheese low sodium 1 Oz - [½ cup 3 Oz boiled mashed potato + 2 tsp oil + 1 boiled egg white] - Cucumber 2Oz Apple 1 small	3Oz full cream yogurt + 1 tbsp Honey

Note: Potassium Leached from potato, Carrot, Squash and Peach.

Useful websites

1. AMERICAN DIETETIC ASSOCIATION– http://www.eatright.org
2. AMERICAN DIABETES ASSOCIATION http://www.diabetes.org
3. National Kidney Foundation https://www.kidney.org

Part III

Malnutrition

Types of malnutrition

Nutritional history

Mechanism of nutrition deficiency

Nutrition Support Therapy

Useful website

Mona Hegazy, MD

MALNUTRITION

Types of malnutrition

In 2009 an international group of nutrition support leaders developed an etiology basis for the definition of malnutrition for hospitalized adult patients. This approach focuses on the following three causes:

1. Starvation-related malnutrition
2. Chronic disease–related malnutrition
3. Acute disease–related malnutrition

The American Society for Parenteral and Enteral Nutrition (A.S.P.E.N.) and the Academy of Nutrition and Dietetics published a consensus document outlining specific criteria for diagnosing severe and non-severe malnutrition.

Consensus Malnutrition Criteria for Acute Illness and Injury Cause

Severe Malnutrition

1. Energy intake ≤ 50% of estimated energy requirement for more than ≥5 days
2. Weight loss (percentage of usual body weight over time period)

- >2% over 1 week
- >5% over 1 month
- >7.5% over 3 months

3. Loss of body fat "Moderate"
4. Loss of muscle mass "Moderate"
5. Fluid accumulation "Moderate to severe"
6. Hand grip strength "Measurably reduced"

Non-Severe Malnutrition

1. Energy intake <75% of estimated energy requirement for >7 days
2. Weight loss (percentage of usual body weight over time period)
   - 1% to 2% over 1 week
   - 5% over 1 month
   - 7.5% over 3 months
3. Loss of body fat "Mild"
4. Loss of muscle mass "Mild"
5. Fluid accumulation "Mild"
6. Hand grip strength "Not applicable"

- Nutritional status can be altered by illness that affects nutrient intake, absorption, or utilization, and it should be a part of any general medical examination or evaluation for a medical disorders.
- Assessment comprises a history, physical examination, and laboratory tests. Figure 3-1" difference between malnutrition and mall practice in nutrition"

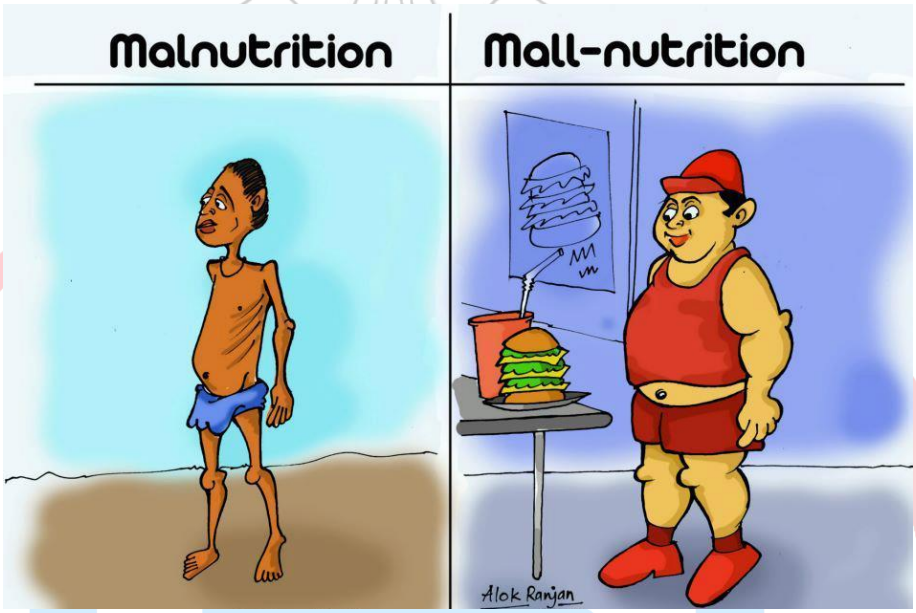


Figure 3-1 malnutrition and mall practice in nutrition

Nutritional history

Key Questions should become a routine part of the history:

1. **Has the patient's weight changed recently? How much and how rapidly?**

2. Has the patient's appetite changed? Is the appetite change caused by altered taste or smell, problems with chewing or swallowing, poorly fitting dentures, or depression?

3. Who prepare meals for the patient, and has that changed recently? Who shops and pay for food?

4. Are symptoms of gastrointestinal tract disease present?

5. Does the patient consume alcohol, medications, or dietary supplements or herbal remedies?

6. Is the patient on restricted diet of any sort?

Mechanism of nutrition deficiency

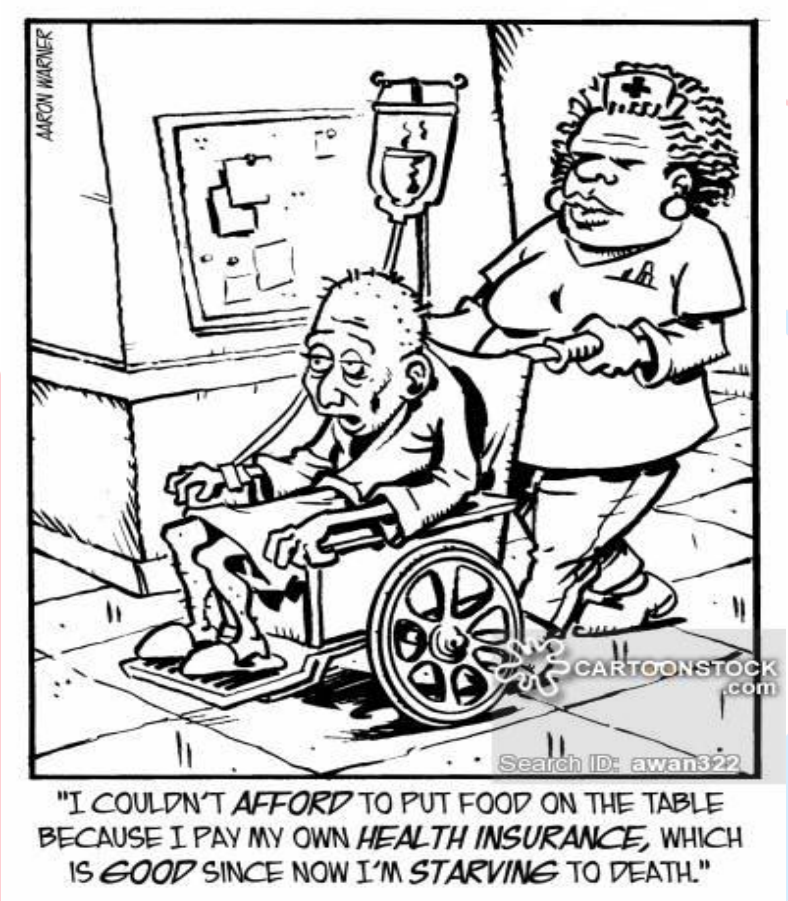
A. **Inadequate intake** figure 3-2

- For all foods, should ask about weight loss, poverty, dental disease, taste changes, alcoholism, causing deficiency of:

Calories, protein, thiamine, niacin, folate, pyridoxine, and riboflavin

- Fruit, vegetables, and grains, causing deficiency of:

Vitamin C, thiamine, niacin, folate, and dietary fibers



B. Inadequate absorption

- Meat, dairy products, eggs: Protein, vitamin B12 deficiency
- Food idiosyncrasies, allergy: Lactose
- Drugs (antacid, anticonvulsants, cholestyramine, laxative, neomycin, alcohol): Selected vitamins and mineralsdeficiency
- Malabsorption (Diarrhea, weight loss, steatorrhea)

Vitamin A, D,and K, calories, protein, iron, calcium, magnesium, and zincdeficiency

- Surgery (gastrectomy, resection of small intestine)

Vitamin B12, iron, bile salts, and all nutrient if jejunal resection

C. Increased losses

- Blood loss: Iron deficiency
- Diabetes, poorly controlled: Calories deficiency
- Diarrhea: Protein, zinc, and electrolytes deficiency

- Draining abscesses, wounds: Protein deficiency
- Peritoneal dialysis or haemdialysis: protein, water-soluble vitamins, zincdeficiency
- Alcohol abuse: Magnesium, zinc, and phosphorus deficiency

D) Increased requirements

- Drugs (especially diuretics, laxative): potassium& magnesiumdeficiency
- Fever: caloriesdeficiency
- Hyperthyroidism: caloriesdeficiency
- Increased physiologic demands (infancy, adolescence, lactation): Various nutrients deficiency
- Surgery, trauma, burns, infection: Calories&protein deficiency

Nutrition Support Therapy

Nutritional Requirements

1. Energy

- Energy requirements may be calculated as 25 to 30 kcal/kg/day (A.S.P.E.N., 2009).
- Avoidance of overfeeding in the critically ill patient is important.
- **Although adequate energy is essential for metabolically stressed patients, excess calories can result in complications such as hyperglycemia, hepatic steatosis, and excess carbon dioxide production, which can exacerbate respiratory insufficiency or prolong weaning from mechanical ventilation.**

Some debate exists in practice regarding what value should be used for body weight in Obese (with evidence of malnutrition).

- Actual body weight is a better predictor of energy expenditure than ideal body weight in obese individuals.
- Available research suggests that hypocaloric, high-protein nutrition support therapy or "permissive underfeeding" in critically ill obese patients results in achievement of net protein anabolism and minimizes complications resulting from overfeeding.
- A.S.P.E.N., in its 2013 Guidelines for Hospitalized Adult Patients with Obesity, suggests that clinical outcomes in patients supported with high-protein hypocaloric feeding are at least equivalent to those supported with high-protein eu-caloric feeding.

- A trial of hypocaloric high-protein feeding is suggested in those patients who do not have severe renal or hepatic dysfunction.
- The Guidelines recommend that hypocaloric feeding may be started with 50% to 70% of estimated energy requirements or less than 14 kcal/kg actual weight
- High-protein feeding may be started with 1.2 g/kg actual weight or 2 to 2.5 g/kg ideal body weight, with adjustment of goal protein intake based on the results of nitrogen balance studies.
- Moreover, hypocaloric low protein feedings are associated with unfavorable outcomes.

2. Protein

- Patients typically require 1.2 to 2 g/ kg/day depending on their baseline nutritional status, metabolic demand, and abnormal losses.
- Patients with acute kidney injury undergoing continuous renal replacement therapy (CRRT) may have a higher protein requirement because of the increased loss via the filtration process.
- Administration of excessive amounts of protein does not decrease the characteristic net negative nitrogen balance seen among hypermetabolic patients

3. Vitamins, Minerals, and Trace Elements

- Micronutrient needs are elevated during acute illness because of:

a) Increased urinary and cutaneous losses
b) Diminished GI absorption
c) Altered distribution
d) Altered serum carrier protein concentrations.

- With increased caloric intake there may be an increased need for B vitamins, particularly thiamin and niacin.
- Catabolism and loss of lean body tissue increase the loss of potassium, magnesium, phosphorus, and zinc.
- GI and urinary losses, organ dysfunction, and acid-base imbalance necessitate that mineral and electrolyte requirements are determined and adjusted individually.
- Fluid and electrolytes should be provided to maintain adequate urine output and normal serum electrolytes.

Feeding Strategies

- The preferred route for nutrient delivery is an orally consumed diet of whole foods.
- However, critically ill malnourished patients are often unable to eat because of endotracheal intubation and ventilator dependence.
- Furthermore, oral feeding may be delayed by:

1. Impairment of chewing
2. Impairment of swallowing
3. Anorexia induced by pain-relieving medications, or by posttraumaticshock and depression.

- Patients who are able to eat may not be able to meet the increased energy and nutrient requirements associated with metabolic stress and recovery. They often require combinations of oral nutritional supplements, enteral tube nutrition, and PN.
- When EN fails to meet nutritional requirements or when GI feeding is contraindicated, PN support should be initiated.

Timing and Route of Feeding

- EN is the preferred route of feeding for the critically ill patient who cannot eat food and yet has good intestinal function.
- Feedings should be initiated early within the first 24 to 48 hours of admission and advanced toward goal during the next 48 to 72 hours.
- Intake of 50% to 65% of goal calories during the first week of hospitalization is thought to be sufficient to achieve the clinical benefit of EN.
- This practice is intended for patients who are hemodynamically stable. In the setting of hemodynamic instability (large volume requirements or use of high-dose catecholamine agents), tube feeding should be withheld until the patient is resuscitated fully or stable to minimize risk of ischemic or reperfusion injury.
- Either gastric or small-bowel feedings can be used. Small bowel feedings are indicated when gastric residuals exceed 250 mL.
- The cause of diarrhea, when present, should be determined, including assessment for infectious diarrhea. Patients should be evaluated for intake of hyperosmolar medications and broad-spectrum antibiotics.
- Formula selection, fluid, energy, and nutrient requirements, as well as GI function determine the choice of an enteral product.
- Most standard polymeric enteral formulas can be used to feed the critically ill malnourished patient. However, some are intolerant of these standard formulas because of the fat content and temporarily

require a lower-fat formula or a product containing a higher ratio of medium-chain triglycerides.

- Several commercially available products are marketed specifically for patients with trauma and metabolic stress. These products typically have higher protein content and a higher ratio of BCAAs or additional glutamine or arginine.
- Immune modulating enteral formulations that contain arginine, glutamine, nucleic acids, antioxidants, and omega-3 fatty acids potentially have beneficial effects and favorable outcomes for critically ill patients who have undergone GI surgery, as well as for trauma and burn patients. However, these formulations should not be used routinely for ICU patients with sepsis because they may worsen the inflammatory response (A.S.P.E.N., 2009).
- Insoluble fiber should be avoided in critically ill patients; however, soluble fiber may be beneficial for the hemodynamically stable, critically ill patient who develops diarrhea (A.S.P.E.N., 2009).
- Patients at high risk for bowel ischemia initially should not receive fiber-containing formulas or diets.
- **PN is indicated for patients in whom EN is unsuccessful or contraindicated.**

Remember

Types of malnutrition

1. Starvation-related malnutrition
2. Chronic disease–related malnutrition
3. Acute disease–related malnutrition

a) **Severe Malnutrition**
b) **Non-Severe Malnutrition**

Mechanism of nutrition deficiency

1. Inadequate intake
2. Inadequate absorption
3. Increased losses
4. Increased requirements

Nutrition Support Therapy

- Nutritional Requirements
- Feeding Strategies
- Timing and Route of Feeding

Useful websites

1. Critical Care Nutrition
   http://www.criticalcarenutrition.com
2. Society of Critical Care Medicine
   www.sccm.org

PART IV:

Adverse reactions to food

Food intolerance

Food allergy

Exercise-induced food allergy

Asthma & Food Allergy

Practical sessions

Gluten disorders

Practical sessions

Useful websites

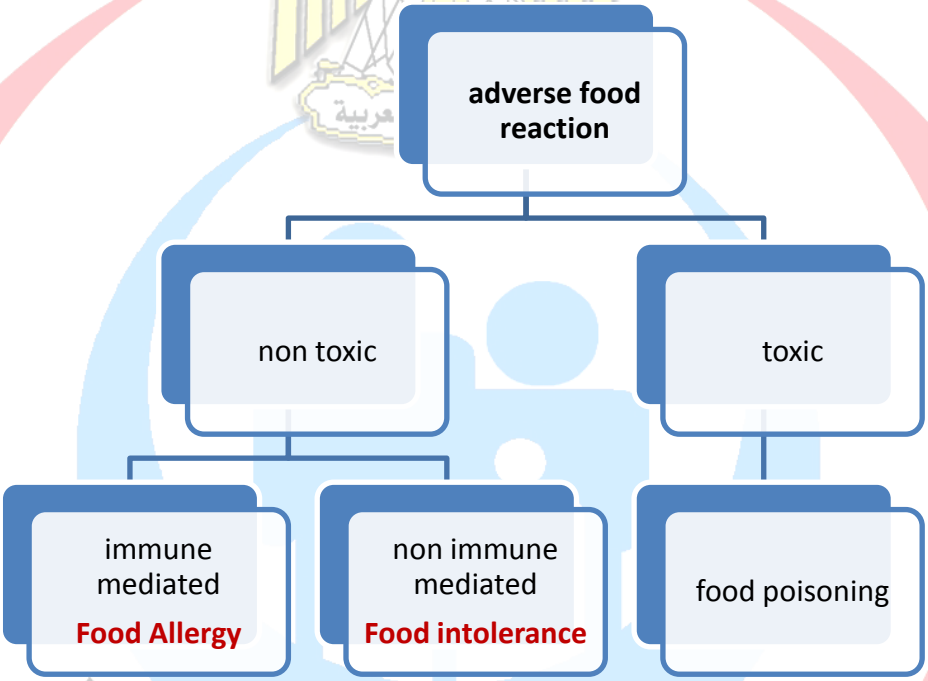
Fardous Solima, PhD

Adverse reactions to food

Food intolerance and Food Allergy

Definition:

An adverse food reaction is defined as any abnormal clinical response that occurs following ingestion of a food or food component. It may be the result of food poisoning, food allergy or intolerances.



Natural substances in foods that can cause adverse reaction:

Food additives: and colorings may cause an acute flare up of allergic reactions.

Additives include Monosodium glutamate (MSG), benzoates, salicylates, sulphites, and tartrazine and other coloring:

A) Monosodium glutamate (MSG)

- May be responsible for Chinese restaurant syndrome

B) Vasoactive amines such as tyramine, serotonin and histamine

- Present naturally in: pineapples, bananas, baked meat, vegetables, red wine, avocados, chocolate, citrus fruits and **mature cheese**.

C) Salicylatesare natural aspirin like compounds

- Present in a wide variety of herbs, spices as well as fruit and vegetables.

D) Sulfites

- Sulfite sensitivity occurs most often in asthmatic adults & may be life threatening.
- **Strict avoidance is advised in asthmatic people with sulfite allergy.**
- Greater than 10 ppm of sulfites present in:
  - dried fruits
  - bottled lemon juice
  - molasses
  - grape juices

Food intolerance

Definition:

Food intoleranceis difficulty in digesting certain foods.

Usually result from deficiency of enzyme needed for metabolism of certain food this can lead to gastrointestinal symptoms such as gases, abdominal pain or diarrhea.

Food intolerance is sometimes confused with a serious condition; Food Allergy.

Lactose intolerance

Lactose is a sugar found in milk and dairy products. It needs lactase enzymes for its digestion. Lactose intolerance is caused by a lack of lactase enzymes.

Symptoms: include

- Gases &Bloating
- Diarrhea
- Abdominal pain

Management:

People with lactose intolerance should avoid dairy products like milk and ice cream.

Fermented products such as yogurt& kefir may be easier to tolerate, as they contain less lactose than other dairy products

There is a very serious difference between being intolerant to a food and having a food allergy.

Food Allergy (FA)

Definition:

Food Allergyis an abnormal **immune** response to a dietary protein (or polysaccharide)

A food allergic reaction involves the immune system. The immune system overreacts by producing specific Immunoglobulin E (IgE) antibodies. These antibodies travel to cells that release chemicals, causing an allergic reaction. Food allergy can cause a serious or even life-threatening anaphylactic reaction by eating a very small amount, touching or inhaling the food.

Food allergens

- **Any food can provoke allergic reactions.**
- The most common food allergy sources, responsible for up to 90% of IgE-mediated food allergic reactions, are the proteins in cows' milk, eggs, peanuts, wheat, soy, fish, shellfish, and tree nuts **(The Big Eight)** figure 4-1.
- Other food allergens include **mustard, celery, sesame seeds and sulphur dioxide.**
- **Children often outgrow allergies to milk, eggs, soybean products and wheat, typically between 3 and 8 years of age.**
- **Children rarely grow out of allergies to peanuts, tree nuts, fish or shellfish.**
- Peanut was the allergen most frequently associated with anaphylactic food reactions, followed by tree nuts/seeds (including sesame).

Figure 4-1 the big eight Allergens

The most common food allergens in children are:

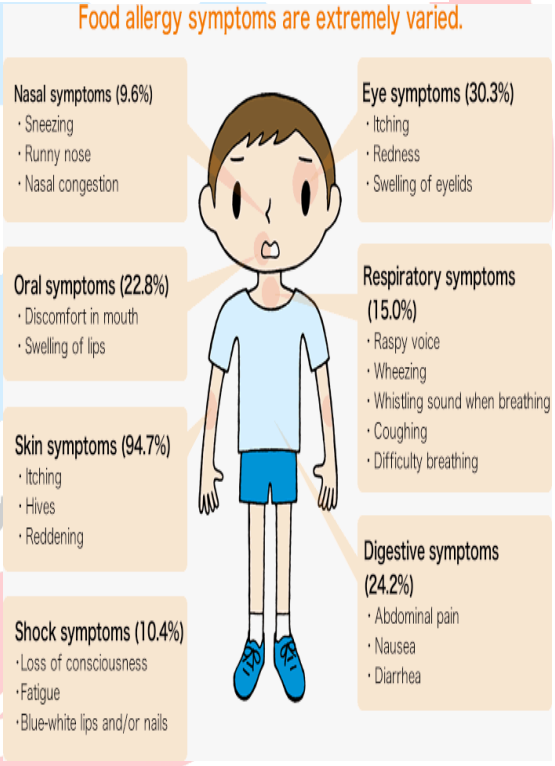
- Milk
- Eggs
- Peanuts

Children may outgrow their allergic reactions to milk and to eggs. Peanut and tree nut allergies are likely to persist.

The most common food allergens in adults are:

- Fruit and vegetable pollen (oral allergy syndrome)
- Peanuts and tree nuts
- Fish and shellfish

Peanuts, tree nuts, fish and shellfish usually persist



Symptoms of food allergy: figure 4-2

Figure 4-2Symptomes of food allergy

Anaphylaxis

- **Anaphylaxis** is a severe systemic reaction to allergen (such as nuts, bee stings or drugs), body-wide degranulation of mast cells leads to release of histamine and other mediators that cause vasodilatation and, if severe, symptoms of life-

	Food intolerance	Food allergy
Cause	Deficiency of certain enzyme	
Age of onset	Starts at any age	Usually in infants Could start at any age
Amount of food that cause symptoms	Dose related	Small amount may cause severe reaction
Onset of symptoms	Typically occurs several hours after ingesting the causative food	Usually within few minutes to 2 hours
Symptoms	Usually gastrointestinal symptoms such as: intestinal gas, abdominal pain or diarrhea.	Skin Gastrointestinal Respiratory
Life threatening	NO	May cause anaphylaxis
Prevention& Treatment	**Diminish** the amount of causative food	**Elimination** of causative food
Examples of Most common causative foods	Lactose, fructose, wheat	The big eight (Milk, Egg, wheat, Soy, tree nuts, peanut, fish & shellfish)

Table (1) Food intolerance versus food allergy

Threatening**shock**.

- Foods that cause the majority of severe or anaphylactic reactions include:

Peanuts, Tree Nuts, Fish& Shellfish

- Severe allergic reaction to a food usually develop within one hour from food ingestion
- Severe and fatal reactions can occur at any age and even upon first known exposure to a food, but those at greatest risk for fatal food-induced anaphylaxis appear to be adolescents and young adults with asthma and a known food allergy to peanut, tree nut or seafood

Management: Any person experienced severe food allergies, should have an ***epinephrine*** (adrenaline) injection at all times. ***In case of having a severe reaction, an immediate intramuscular injection of epinephrine and send out to emergency ward***

Exercise-induced food allergy

- As the body is stimulated by exercise, a person with an exercise-induced food allergy may feel itchy and lightheaded.
- In severe cases, it can cause reactions such as hives or anaphylaxis.
- Food Triggers: wheat, shellfish, and nuts are noted as the most common food triggers. Less commonly reported food triggers include meat, vegetables, fruit, seeds, and cereals.
- The time between food ingestion and exercise about 30 to 120 minutes
- Drinking alcohol or taking a non-steroidal anti-inflammatory drug (NSAID) such as aspirin or ibuprofen may also trigger an allergy in people with this syndrome.
- ***Prophylaxis is by avoidance of taking foods, alcohol, aspirin or other NSAID for 2 hours before exercise.***

Asthma & Food Allergy

- **Food-induced asthma symptoms should be suspected in patients with refractory asthma and history of:**
  - atopic dermatitis
  - gastro esophageal reflux GERD
  - food allergy or feeding problems in infant,
  - history of positive skin tests or reactions to food
- ***Individuals with food allergies who also have asthma may be at increased risk for severe or fatal food allergy reactions.***

Management of food allergy:

AVOIDANCE is the only way to prevent an allergic reaction.

In food Allergy,avoid:

The offending allergen

- Foods containing additives
- Foods containing artificial colors

- Canned foods
- Hidden food allergens

- **Hidden food allergens:** Some food allergens are masked and may be taken un-noticed, they include:

  - Spices: Mustard, pepper, sesame.
  - Legumes and tree nuts, Peanut& soy.
  - Milk protein (protein supplements): Casein, caseinates.
  - Vaccines
  - Kitchen tools.
  - Volatile allergens.
  - Parasitized food such as:
    - Mites in flour (pasta, pizzas)
    - Anisakis simplex in fish.

Food labeling

Since November 2005 European Union (EU) legislation has decreed that all pre-packaged foods sold within the EU must be labeled with the eight food as well as the less common food allergens: sesame, mustard, celery, sulphites, molluscs and lupin.

Risks for impaired growth in children with food allergy:

Role of dietician is very important to avoid impaired child growth which may develop due to:

- Inadequate food intake
- Elimination of multiple foods from diet
- Elimination of nutritionally essential foods from diet (milk, cereals)
- Poor compliance in dietary management (refusal to extend dietary types)

Recommendation

- Food allergies at any age require:

    1. Increase the awareness of food allergies
    2. Strict attention to food eaten,
    3. Careful reading of food labels,
    4. Knowing food allergen derivatives, e.g.: butter is a milk product& mayonnaise is derived from egg.
    5. Learning how to be extremely specific when eating out.
    6. How to expect and manage allergic reactions.

- Even healthy natural foods can have adverse effect if a person is allergic to them.
- We can develop allergy even for foods we used to consume.
- The following foods are highly allergenic, to be careful with: dairy products, eggs, nuts, peanut, wheat, Soy, Fish &shellfish. Bananas, beef products, chocolate, citrus fruits, corn, oats, processed and refined foods, strawberries & tomatoes.
- **Children can outgrow many food allergies by the age of 10.**
- **Allergy to peanut, tree nut, or seafood usually outstand for life and may cause severe reactions.**
- Egg white is more allergenic than egg yolk.
- Oils made from ingredients that cause allergy to some persons, should be avoided by them.
- Avoid any food products that contain artificial color or any other food additives.
- Cooking can destroy a number of the allergens in fruits and vegetables. However, the allergens in some vegetables, such as celery, aren't affected by cooking.
- Cooked meat is less likely to cause a problem with those with cow's milk allergy.
- Many people with milk and egg allergies can tolerate extensively heated milk and egg in baked foods.

- Newer processing techniques, such as high-pressure treatment of foods, fermentation and enzyme treatment, can help to reduce the allergen city of some food proteins.

- A food allergy management plan is needed for all persons with food allergy, and should include the need for an Epinephrine vials.

Practical sessions

In milk allergy:

Avoid foods that contain milk or any of these ingredients:

- Milk (in all forms including condensed, derivative, dry, evaporated, goat's milk and milk from other animals, low-fat, malted, milk fat, non-fat, powder, protein, skimmed, solids, whole)
- Butter, butter fat, butter oil, butter acid, butter ester(s)
- Casein(in all forms)
- Cheese
- Cream
- Custard
- Ghee
- Lactalbumin, lactalbumin phosphate

Avoid other Possible Sources of Milk:

- Artificial butter flavor
- Baked goods
- Caramel candies
- Chocolate
- Lactic acid starter culture and other bacterial cultures
- Luncheon meat, hot dogs and sausages, which may use the milk protein casein as a binder.
- Margarine
- Non-dairy products, as many contain casein
- Some products made with milk substitutes (soy-, nut- or rice-based dairy products) are manufactured on **equipment shared with milk.**
- Many restaurants put butter on grilled steaks to add extra flavor.
- Some medications contain milk protein.

Exercise

1. Plan diet menu for a one year old child with cow's milk allergy.
2. Plan diet menu for a 3 years old child with multiple allergy for milk, egg, chicken and peanut.

Gluten disorders

What is gluten?

Gluten is a protein found in grains, such as wheat, barley and rye. Several conditions relate to gluten, including:

- Gluten intolerance
- Wheat allergy.
- Celiac disease

Gluten intolerance

Gluten intolerance is the body's inability to digest the gluten protein found in wheat and certain other grains such as barley and rye.

People with gluten intolerance should be referred to a gastroenterologist if there is a fear of having celiac disease.

Wheat allergy

Wheat allergy is an allergic reaction to foods containing wheat. Allergic reactions can be caused by eating wheat, but in some cases, by inhaling wheat flour.Avoiding wheat and its products is the primary treatment for wheat allergy

Celiac disease

Celiac disease is an immune reaction triggered by eating gluten, a protein found in wheat, barley and rye, causing inflammation and damage to the small intestine. Celiac disease tends to run in families. Figure 4-3

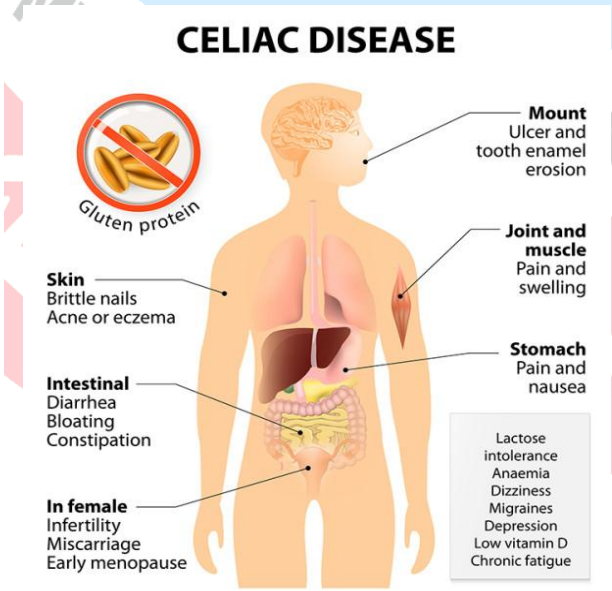


Figure 4-3 Celiac disease

Complications

Celiac disease is a serious condition, if untreated, it can cause:

- Malnutrition that can lead to anemia and weight loss.
- In children, celiac disease can lead to failure to thrive, delayed puberty, weight loss, irritability and dental enamel defects, anemia, arthritis, and epilepsy.
- People with celiac disease who don't maintain a gluten-free diet have a greater risk of developing cancer.

Medical nutrition Therapy

The **only** way to manage the symptoms of celiac disease is to eat a ***Gluten-Free Diet***.

Remember

A gluten-free diet can help reduce symptoms of all conditions related to gluten including gluten intolerance wheat allergy and celiac disease.

For celiac disease patients, products containing wheat, barley and rye, should be **eliminated** and replaced with whole foods that are naturally gluten-free. Figure 4-4

Practical sessions

How to avoid gluten while following a healthy diet?

- Follow a gluten free diet plan
- Check food labels for gluten
- Make healthy choices of foods to eat
- Avoid medicines and other products that may contain gluten such as some artificial sweeteners and cosmetics.

Foods to avoid

- Wheat and all its products

Common foods that regularly contain ingredients with gluten include:

- breads
- pastas
- crackers
- seasonings and spice mixes

Other forms of wheat should be avoided. These include:

- wheat starch
- wheat bran
- wheat germ
- couscous
- cracked wheat
- farina
- gliadin
- semolina

Other grains containing gluten include:

- barley
- rye
- triticale and Mir (a cross between wheat and rye)
- Oats don't contain gluten, but are often processed in facilities that produce gluten-containing grains and may be contaminated.

Gluten may also be an ingredient in:

- barley malt
- chicken broth
- malt vinegar
- some salad dressings
- veggie burgers

- soy sauce
- noodles
- seasonings and spice mixes
- condiments powders

Malt in various forms including: malted barley **flour, malted** milk **or** milkshakes**, malt extract, malt syrup, malt flavoring, malt** vinegar**.**

***Malt* is germinated cereal grains that have been dried in a process known as "*malting*". ... *Various* cereals are *malted,* though barley is the most common.** Figure 4-5

Figure 4-5 Germinated cereals grain

Foods to Eat

There are many nutritious and naturally gluten-free foods out there. It is much easier to follow a gluten-free diet with cutting out processed foods and practicing label reading.

Some foods that can be included in a healthy gluten-free diet:

- Meat, poultry and seafood
- Eggs
- Dairy
- Fruits
- Gluten-free grains, such as quinoa, rice, buckwheat and millet
- Vegetables
- Legumes
- Nuts
- Healthy fats
- Herbs and spices

Gluten-free grains and grain products*	Serving size
*Products vary by manufacturer, so be sure that the brand you purchase is gluten-free	
Breads • Breads and bagels ready-made from rice, potato, bean, soy, corn, sorghum • Frozen, gluten-free waffles • Gluten-free pizza crust made from a mix or frozen ready-made • Homemade breads, biscuits, pancakes, waffles, muffins or quick breads made from gluten-free flours • Corn tortillas	1 slice or piece
Cereals • Cooked cereal made from corn, rice, quinoa or gluten-free oats • Gluten-free puffed rice • Gluten-free cornflakes, rice flakes, or other dry cereals • Gluten-free granola	1/2 to 1 cup
Snacks • Crackers or crisp breads made from rice or corn • Popcorn • Rice cakes • Corn chips	1 oz. (check label)
Other • Brown, wild or white rice • Pasta made from rice, corn, quinoa • Corn • Quinoa • Millet	1/2 to 1 cup

Oats may not be harmful for most people with celiac disease.

Exercise

1. Plan gluten free diet menu of 2000kcal.
2. Plan diet menu of 1200 kcal for a case of wheat allergy.

Useful websites

1. American Academy of Allergy, Asthma, and Immunology

http://www.aaaai.org

2. American Academy of Pediatrics

http://www.aap.org

3. American Academy of Allergy Asthma and Immunology

www.foodallergy.org/allergens

PART V:

Therapeutic diet

Definition

Types and indications

Useful websites

Abdou Mahmoud, PhD

Therapeutic Diet" Dietary Modifications"

Definition

A therapeutic diet is a meal plan that controls the intake of certain foods or nutrients. It is part of the treatment of a medical condition and are normally prescribed by a physician and planned by a dietician. A therapeutic diet is usually a modification of a regular diet. It is modified or tailored to fit the nutrition needs of a particular person. Therapeutic diets are modified for (1) nutrients, (2) texture, and/or (3) food allergies or food intolerances.

During illness, many patients can meet energy and nutrient needs by following a standard diet. Other patients may require a modified diet, which is altered by changing food consistency or nutrient content or by including or eliminating specific foods.

Diets with altered texture and consistency are often prescribed for individuals with chewing and swallowing difficulties. Diets with modified nutrient or food content are frequently used to relieve disease symptoms or reduce the risk of developing complications. Some patients may have several medical problems and need a number of dietary changes. The modified diets should be adjusted to satisfy individual preferences and tolerances and may also need to be altered as a patient's condition changes

➢ Types of Therapeutic diet

1) Nothing by Mouth (NPO): An order to not give a patient anything at all—food, beverages, or medications—is indicated by NPO, an abbreviation for Non perOs, meaning "nothing by mouth." For example, an order may read "NPO for 24 hours" or "NPO until after X-ray." The NPO order is commonly used during certain acute illnesses or diagnostic tests involving the GI.

2) Mechanically Altered Diets

Mechanically altered diets are helpful for individuals who have difficulty chewing or swallowing. Chewing difficulties usually result from dental problems. Impaired swallowing, or dysphagia, may result from neurological disorders, surgical procedures involving the head and neck, and various physiological or anatomical abnormalities that restrict the movement of food within the throat or esophagus. Dysphagia diets are highly individualized because swallowing problems can vary greatly. Furthermore, patients must be monitored regularly because swallowing ability can fluctuate over time.

Some diets may contain mostly pureed foods (pureed diet), whereas a less restrictive diet may include moist, soft-textured foods that easily form a bolus (mechanical soft diet, or simply, soft diet). Diets for people with chewing problems typically include foods that are ground or minced (ground/minced diet). Note that the foods used in these diets can overlap, and individual tolerances should ultimately determine whether foods are included or excluded.

3) Pureed Diets

Milk products: Milk, smooth yogurt, pudding

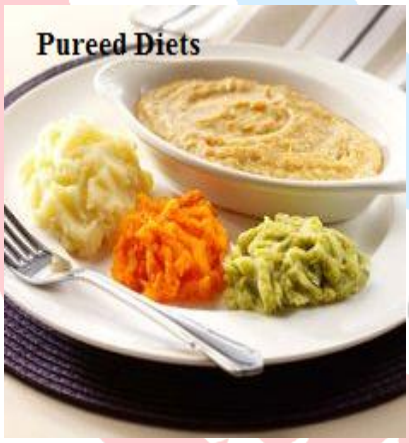
Fruits: Pureed fruits and juices without pulp, skin, seeds, or chunks; well-mashed fresh bananas; applesauce.

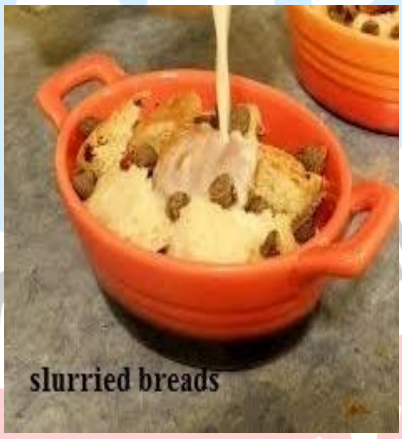
Vegetables: Pureed cooked vegetables without seeds or skins, mashed potatoes, pureed potatoes with gravy

Meats and meat substitutes: Pureed meats (with gravy), pureed legume spread

Breads and cereals: Smooth cooked cereals such as cream of wheat, slurried breads and pancakes, a pureed rice and pasta

Mechanical Soft Diets





Slurred foods are mixed with liquid until the consistency is appropriate

Blenderized Liquid Diet:

Blenderized diets may be prescribed following oral or facial surgeries or be recommended to individuals with chewing, swallowing problems, or cannot tolerate solid foods.

Soft or tender foods that can be blenderized (often with added liquid) are available from all food groups, and they include cereals and breads; cooked vegetables; fresh or cooked fruits without skins and seeds; cooked, tender meats and fish; and potatoes, rice, and pasta. Foods that do not blend well should be excluded; examples include nuts and seeds, dried fruits, sausage and, hard cheeses, raw vegetables, corn, and celery.

Clear Liquid Diet:

Clear liquids, which require minimal digestion and are easily tolerated by the gastrointestinal (GI) tract, are often the foods recommended before some GI procedures (such as GI examinations, X-rays, or surgeries), after GI surgery, or after fasting or intravenous feeding. **The clear liquid diet** consists of clear fluids and foods that are liquid at body temperature and leave little undigested material (called residue) in the colon.

Permitted Foods include clear or pulp-free fruit juices " pectin free juices ", carbonated beverages, clear meat and vegetable broths, fruit flavored or unflavored gelatin, fruit ices made from clear juices.

Although the clear liquid diet provides fluid and electrolytes, its nutrient and energy contents are extremely limited "It used for not longer than 3 days"

Full Liquid Diet

A liquid diet that is not limited to clear liquids is used as a transitional diet between liquids and solid foods. In addition to clear liquids, a full liquid diet may include milk, cream soups, and thin cereal broths. Moreover, a gradual progression from clear liquids to solid foods is generally unnecessary.

Fat-Restricted Diet

A fat-restricted diet is recommended for reducing the symptoms of fat mal-absorption, which frequently accompanies diseases of the liver, gallbladder, pancreas, and intestines. Fat restriction may also alleviate the symptoms of heartburn. Although fat intake is occasionally limited to as little as 25 grams daily, it should not be restricted more than necessary, because fat is an important source of kcalories and fat soluble vitamins. Most foods included in a fat-restricted diet provide less than 1 gram of fat per serving.

The diet includes fat-free milk products, most bread and cooked grains, fat-free broths and soups, vegetables prepared without fats and most fruits. Lean meat and meat substitutes are permitted but may be restricted to 4 to 6 ounces per day, depending on the degree of restriction.

Restricted foods include low-fat and whole-milk products, baked products with added fat, and most prepared desserts. Some patients with mal-absorptive conditions cannot tolerate large amounts of lactose or dietary fiber, so foods that include these substances may also need to be excluded from the diet.

Fiber-Restricted

Diet Fiber restriction is recommended during acute phases of intestinal disorders, when the presence of fiber may exacerbate intestinal discomfort or cause diarrhea or blockages. Fiber-restricted diets are sometimes used before surgery to minimize fecal volume and after surgery during transition to a regular diet. Long term fiber restriction is discouraged, however, because it is associated with constipation, diverticulosis, and other problems.

Fiber-restricted diets often eliminate whole-grain breads and cereals, nuts and seeds, raw and dried fruits, berries, dried beans and peas and most raw vegetables.

= If required, even greater reductions in colonic residue can be achieved by following a low-residue diet, which excludes most fruits and vegetables, foods high in resistant carbohydrate, milk products that contain significant lactose, and foods that contain fructose or sugar

These foods contribute to colonic residue because some of their nutrients may be poorly digested (such as the lactose in milk) or poorly absorbed (such as sorbitol and fructose). Note that the terms “low-fiber diet” and “low-residue diet” are often used interchangeably. Low-residue diet: a diet low in fiber and other food constituents that contribute to colonic residue.

Sodium-Restricted Diet

Sodium restriction can help to prevent or correct fluid retention and is often recommended for treatment of hypertension, congestive heart failure, kidney disease, and liver disease. The degree

of restriction depends on the illness, the severity of symptoms, and the specific drug treatment prescribed. In most cases, sodium is restricted to 2000 or 3000 milligrams daily, although more severe restrictions may be used in the hospital setting. Many patients find it difficult to comply with sodium restrictions, so while the sodium recommendation is an attempt to improve the patient's medical problem; it may still exceed the tolerable upper intake
Level (UL) for sodium of 2300 milligrams.

A sodium-restricted diet limits the use of salt (both in cooking and at the table), eliminates most prepared foods and condiments, and limits consumption of milk products (if excessive in salt content). Because so many processed foods are high insodium, people following a sodium-restricted diet should check food labels andconsume only low-sodium products. Sodium restriction is difficult to implement ona long-term basis because many people find low-sodium diets unpalatable and failto adhere to them.

High-calorie, High-Protein Diet

The high-calorie, high-protein diet is used to increase calorie and protein intakes in patients who have unusually high requirements or in those who are eating poorly. It may help to prevent or reverse malnutrition, improve nutrition status, promote weight gain and decreased muscle wasting.

High-fat foods are added to increase energy intakes; consequently, the diet may exceed 35 percent calories from fat. Consuming small, frequent meals and commercial liquid supplements (such as Ensure) can also help a patient meet increased energy, protein, and nutrient needs. Some of these foods are high in saturated fat, which is limited in heart healthy diets.

Case study:

Use food composition table to plan a clear liquid diet that gives 300 kcal / day

Useful websites

AMERICAN DIETETIC ASSOCIATION
http://www.eatright.org

PART VI:

Enteral & Parenteral nutrition

Enteral Nutrition

Parenteral Nutrition

Useful websites

Mona Hegazy, MD

Physicians only allowed dealing with enteral, parenteral nutrition support and refeeding syndrome

Enteral Nutrition (EN)

Definition: EN is a nutrition provided through the gastrointestinal tract via a tube, catheter, or stoma that delivers nutrients distal to the oral cavity"feeding tube with the tip in the stomach or small bowel".

Indications for Enteral Nutrition

- **Patient Selection**
  Individuals with a functional GI tract, along with clinical situations in which oral intake are deemed unsafe, insufficient, or impossible, are candidates for EN support.
- **Benefits**
  1. Utilizing the normal route of digestion and absorption of the GI tract supports maintenance of the functional integrity of the gut.
  2. EN is the preferred route of feeding due to the benefits of supporting the components of the gut barrier functions.
  3. Nutrients provided via the enteral route undergo first-pass metabolism, promoting efficient utilization of the nutrients.
  4. The presence of nutrients in the small intestine maintains normal gallbladder function by stimulating the release of cholecystokinin, reducing the risk of cholecystitis that may occur with parenteral nutrition.
  5. Luminal nutrients provide structural support and also aid to maintain the gut-associated and mucosa-associated lymphoid tissues vital to gut-associated immune function. IgA, secreted within the GI tract, can prevent bacterial adherence and translocation. IgA production is reduced when intraluminal nutrients are not present.
  6. EN has been shown to reduce infectious complications associated with pneumonia, sepsis, intravenous line sepsis.
  7. From a cost standpoint, the overall provision of EN is less expensive than parenteral nutrition

Contraindications forEN

Although EN is the preferred route of nutrition support, it may be contraindicated in certain circumstances

1. Non-operative mechanical GI obstruction
2. Intractable vomiting/diarrhea refractory to medical management

3. Severe short-bowel syndrome (100 cm small bowel remaining)
4. Paralytic ileus
5. Distal high-output fistulas (too distal to bypass with feeding tube)
6. Severe GI bleed
7. Severe GI malabsorption
8. Inability to gain access to GI tract
9. Need is expected for 5–7 days for malnourished adult patients or 7–9 days if adequately nourished
10. Aggressive intervention not warranted or not desired

➢ Timing of Enteral Nutrition

- Specialized nutrition support "should be initiated in patients with inadequate oral intake for 7 to 14 days, or in those patients in whom inadequate oral intake is expected over a 7- to 14-day period."

- For critically ill patients, EN should be initiated early within 24 to 48 hours of admission to the ICU.

➢ Dosing of Enteral Nutrition

1. Achievement of greater than 50% to 65% of goal calories during the first week of hospitalization is desired.
2. EN delivery must reach as consistent infusion of 90% of a calculated caloric goal.

➢ Enteral access selection depends on the:

1. Anticipated length of time enteral feeding will be required
2. Degree of risk for aspiration or tube displacement
3. Patient's clinical status
4. Adequacy of digestion and absorption
5. Patient's anatomy (e.g., after previous surgical resection or in extreme obesity)
6. Whether future surgical intervention is planned.

➢ Enteral Nutrition Access figure6-1

A)**Short-Term Enteral Nutrition Support** (no more than 3 to 4 week)

1. Naso-gastric Access
2. Naso-duodenal or Naso-jejunal Access

Potential Complications of Naso-enteric Tubes

1. Esophageal strictures
2. Gastroesophageal reflux resulting in aspiration pneumonia
3. Tracheoesophageal fistula
4. Incorrect position of the tube leading to pulmonary injury

5. Mucosal damage at the insertion site
6. Nasal irritation and erosion
7. Pharyngeal or vocal cord paralysis
8. Rhinorrhea, sinusitis, otitis media
9. Ruptured gastroesophageal varices in hepatic disease
10. Ulcerations or perforations of the upper gastrointestinal tract and airway

B) **Long-Term Enteral Access** (EN is required for more than 3 to 4 weeks)

1. Gastrostomy
2. Jejunostomy

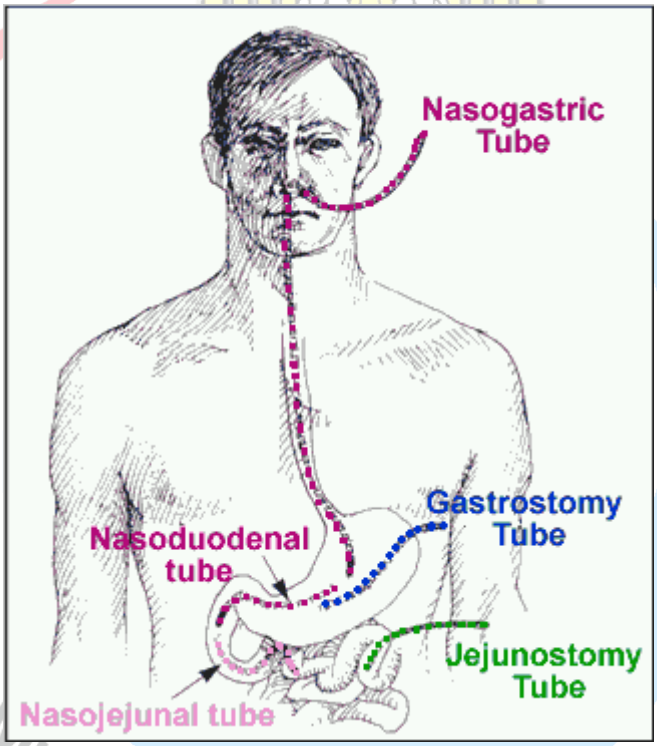


Figure6-1Enteral Nutrition Access

➢ Formula Content and Selection

Enteral formulas are classified as:

1. Standard
2. Chemically defined (elemental)
3. Specialized (marketed for specific clinical conditions or diseases).

Selection of an enteral formula for a specific patient should involve consideration of the patient's:

a) Nutrient needs
b) GIT function
c) Clinical status

In the past, osmolality was considered key to EN tolerance, and belief was widespread that EN formulas should be the same osmolality as body fluids

(290 mOsm/kg). However, studies in the mid-1980s showed that patients tolerate feedings across a wide range of osmolality

Factors to Consider when Choosing an Enteral Formula

1. Ability of the formula to meet the patient's nutrient requirements
2. Caloric and protein density of the formula (i.e., kcal/ml, g protein/ml, ml fluid/L)) Gastrointestinal function
3. Sodium, potassium, magnesium, and phosphorus content of the formula, especially for patients with cardiopulmonary, renal, or hepatic failure
4. Form and amount of protein, fat, carbohydrate, and fiber in the formula relative to the patient's digestive and absorptive capacity
5. Cost effectiveness of formula
6. Patient compliance
7. Cost-to-benefit ratio

Formula content

A) Protein

The amount of protein in available commercial enteral formulas varies from 6% to 25% of total kilocalories

B) Carbohydrate

- Carbohydrate content in enteral formulas varies from 30% to 85% of kilocalories.
- Corn syrup solids typically are used in standard formulas. Sucrose is added to flavored formulas that are meant for oral consumption

C) Lipid

- Lipid content of enteral formulas varies from 1.5% to 55% of the total kilocalories.
- In standard formulas, lipid as corn, sunflower, safflower, or canola oil provides between 15% and 30% of the total kilocalories.
- Elemental formulas contain minimal amounts of fat, typically in the form of mediumchain triglycerides (MCTs) rather than long-chain (LCTs) triglycerides

D) Fluid

Adult fluid needs often are estimated at 1 ml of water per kilocalorie consumed, or 30 to 35 ml/kg of usual body weight.

➢ Administration EN

EN may be administered as a:

a) **Bolus** (optimal for patients with adequate gastric emptying who are clinically stable)
b) **Intermittent** (allow mobile patients to enjoy an improved quality of life by offering time "off the pump")
c) **Continuous feeding** (It requires a pump. This method is appropriate for patients who do not tolerate the volume of infusion used with the bolus, cyclical or intermittent methods)

Selection of the optimal method should be based on:

1. Patient's clinical status
2. Living situation
3. Quality-of-life considerations

One method may serve as a transition to another method as the patient's status changes.

➢ Complications of EN Nutrition

A) Access

1. Leakage from ostomy/stoma site
2. Pressure necrosis/ulceration/stenosis
3. Tissue erosion
4. Tube displacement/migration
5. Tube obstruction/occlusion

B) Administration

1. Microbial contamination
2. Enteral misconnections or misplacement of tube (causing infection, aspiration pneumonia, peritonitis, pulmonary or venous infusion)
3. Regurgitation
4. Inadequate delivery for one or more reasons

C) Gastrointestinal

1. Constipation
2. Delayed gastric emptying/elevated gastric residual volume
3. Diarrhea
4. Osmotic diarrhea, especially if sorbitol is present in liquid drug preparations
5. Secretory Distention/bloating/cramping
6. Formula choice/rate of administration
7. Intolerance of nutrient components
8. Maldigestion/malabsorption Nausea/vomiting

D) Metabolic

1. Drug-nutrient interactions

2. Glucose intolerance/hyperglycemia/hypoglycemia Dehydration/overhydration
3. Hypernatremia/hyponatremia
4. Hyperkalemia/hypokalemia
5. Hyperphosphatemia/hypophosphatemia
6. Micronutrient deficiencies (notably thiamin)
7. Refeeding syndrome

➢ Monitoring the Patient Receiving Enteral Nutrition

1. Ask about abdominal distention and discomfort
2. Confirm proper tube placement and maintain head of bed 30 degrees(daily)
3. Change feeding delivery container and tubing (daily)
4. Fluid intake and output (daily)
5. Gastric residual volume if appropriate
6. Signs and symptoms of edema or dehydration (daily)
7. Stool frequency, volume, and consistency (daily)
8. Weight (at least 3/week)
9. Nutritional intake adequacy (daily)
10. Clinical status/physical examination (daily)
11. Serum electrolytes, blood urea nitrogen, creatinine, (daily till stable, then 2 to 3 times/week)
12. Serum glucose, calcium, magnesium, phosphorus (daily till stable, then weekly)

PARENTERAL NUTRITION (PN)

Definition

PN provides nutrients directly into the bloodstream intravenously.

➢ Indications

- PN is indicated when the patient or individual is unable or unwilling to take adequate nutrients orally or enterally.
- PN may be used as an adjunct to oral or EN to meet nutrient needs. Alternatively, PN may be the sole source of nutrition during recovery from illness or injury or may be a life-sustaining therapy for patients who have lost the function of their intestine for nutrient absorption.

➢ PN Access Figure 6-2

1. Peripheral Access
2. Short-Term Central Access
3. Long-Term Central Access

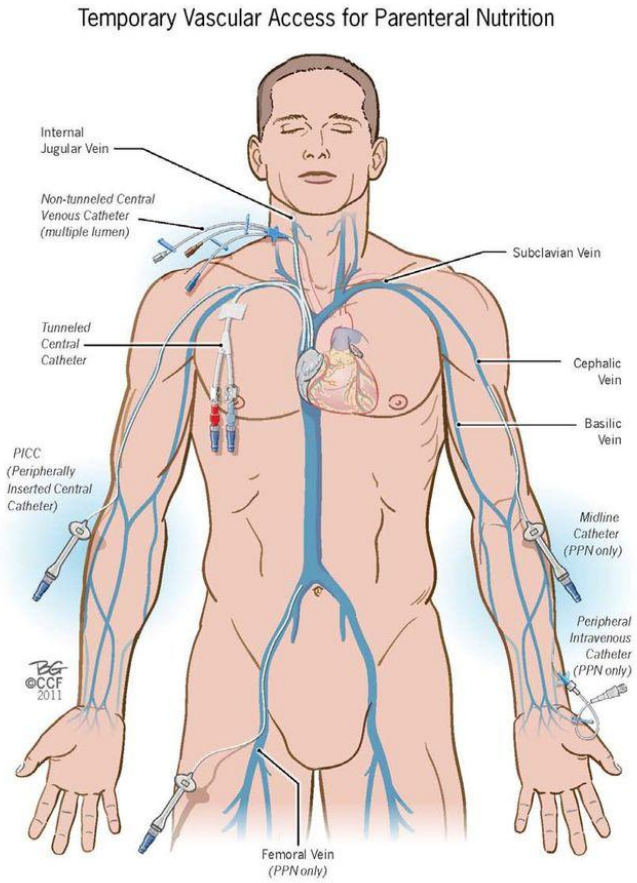


Figure 6-2Access for PN

➢ Parenteral Solutions

A) Protein

- Commercially available standard PN solutions contain all essential amino acids and only some of the nonessential amino acids.
- The concentration of amino acids in PN solutions ranges from 3% to 20% by volume. Thus a 10% solution of amino acids supplies 100 g of protein per liter (1000 ml).
- The use of carbohydrates (100 g daily for a 70-kg person) ensures that protein is not catabolized for energy during conditions of normal metabolism

B) Lipids

- Administration should not exceed 2 g of lipid emulsion per kilogram of body weight per day, although recommendations of 1 to 1.5 g/kg are more common.
- Triglyceride levels should be monitored. When they exceed 400, the lipid infusion should be discontinued.
- A 10% lipid emulsion contains 1.1kcal/ml, whereas a 20% emulsion contains 2kcal/ml.
- Providing 20% to 30% of total calories as lipid emulsion should result in a daily dosage of approximately 1 g of fat per kilogram of body weight

C) Carbohydrates

- It is supplied as dextrose monohydrate in concentrations ranging from 5% to 70% by volume.
- Maximum rates of carbohydrate administration should not exceed 5 to 6 mg/kg/min in critically ill patients

D) Electrolytes, Vitamins, Trace Elements

Daily Electrolyte Requirements during Total Parenteral Nutrition in Adults**:**

1. Calcium 10-15 mEq
2. Magnesium 8-20 mEq
3. Phosphate 20-40 mmol
4. Sodium 1-2 mEq/kg + replacement
5. Potassium 1-2 mEq/kg
6. Acetate As needed to maintain acid-base balance
7. Chloride As needed to maintain acid-base balance

E) Fluid

1. Fluid needs for PN or EN are calculated similarly.
2. Maximum volumes of CPN rarely exceed 3 L, with typical prescriptions of 1.5 to 3 L daily.

Nutrient Osmolarity (mOsm/ml) Sample Calculations

1. Dextrose 5% "0.25/ 500 ml"
2. Dextrose 10% "0.505/ 500 ml"
3. Dextrose 50% "2.52/500 ml"
4. Dextrose 70% "3.53/500 ml"
5. Amino acids 10% "0.998/1000 ml"
6. Lipids 10% "0.6/500 ml"
7. Lipids 20% "0.7 500 ml"
8. Electrolytes Varies by additive Multitrace elements "0.36/5 ml" 5 , Multivitamin concentrate 4.11/10 ml

➢ Administration

- Continuous Infusion
- Cyclic Infusion

➢ Parenteral Nutrition Complications

A) Mechanical Complications

1. Air embolism
2. Arteriovenous fistula
3. Brachial plexus injury
4. Catheter fragment embolism
5. Catheter misplacement
6. Cardiac perforation
7. Central vein thrombophlebitis
8. Endocarditis
9. Hemothorax
10. Hydromediastinum
11. Hydrothorax
12. Pneumothorax or tension pneumothorax
13. Subcutaneous emphysema
14. Subclavian artery injury
15. Subclavian hematoma
16. Thoracic duct injury

B) Infection and Sepsis

1. Catheter entrance site
2. Catheter seeding from bloodborne or distant infection
3. Contamination during insertion

4. Long-term catheter placement
5. Solution contamination

C) Metabolic Complications

1. Dehydration from osmotic diuresis
2. Electrolyte imbalance
3. Essential fatty acid deficiency
4. Hyperosmolar, nonketotic, hyperglycemic coma
5. Hyperammonemia
6. Hypercalcemia
7. Hyperchloremic metabolic acidosis
8. Hyperlipidemia
9. Hyperphosphatemia
10. Hypocalcemia
11. Hypomagnesemia
12. Hypophosphatemia
13. Rebound hypoglycemia on sudden cessation of PN in patient with unstable glucose levels
14. Uremia
15. Trace mineral deficiencies

D) Gastrointestinal Complications

1. Cholestasis
2. Gastrointestinal villous atrophy
3. Hepatic abnormalities

REFEEDING SYNDROME

- Patients who require enteral or PN therapies may have been eating poorly before initiating therapy because of the disease process and may be moderately to severely malnourished.
- Aggressive administration of nutrition, particularly via the intravenous route, can precipitate refeeding syndrome with severe, potentially lethal electrolyte fluctuations involving metabolic, hemodynamic, and neuromuscular problems.
- Refeeding syndrome occurs when energy substrates, particularly carbohydrate, are introduced into the plasma of anabolic patients

(Physicians only allowed dealing with enteral, parenteral nutrition support and refeeding syndrome)

Case study

Calculation of Enteral Nutrition Prescription (Adult Patient):

Select formula for this patient.

Example: Standard 1.0 kcal/mL formula

Determine required kcal/day.

Example: Patient needs 2000 kcal/day

1. Divide total number of kcal required by kcal/mL to determine mL per day needed. Example: 2000 kcal needed, 1.0 kcal/mL = 2000 mL/day
2. To determine protein dose, multiply daily formula in mL by grams of protein/L Example: 2000 mL/day X 44 g/L = 88 g/day protein
3. Assure that this volume of the selected EN formula will provide adequate micronutrient dosing.
4. Determine required fluid in mL/day.
5. Multiply percent water in formula time daily formula in mL to determine water contribution of EN.
6. Subtract formula water from total fluid requirements to determine water flushes. Example: Patient needs 2200 mL fluid. 2000mL formula 84% water=1680 mL water.
7. 520 mL additional water. (Some of which may already be met by IV fluid or medication dilution.)
8. Determining Administration Rate: Take total mL per day of formula and divide by 24 hours to determine continuous feeding goal rate. Example: 2000 ml 24 hours = 83 mL/hour

Useful Websites

1. American Society for Parenteral and Enteral Nutrition
   http://www.nutritioncare.org/
2. European Society for Parenteral and Enteral Nutrition
   http://www.espen.org

PARTVII

Pediatric

Malnutrition

Vitamin D Deficiency

Anemia

Nutritional management of infants and children withsome chronic diseases

Useful websites

Fardous Soliman, PhD

Malnutrition

Definition:

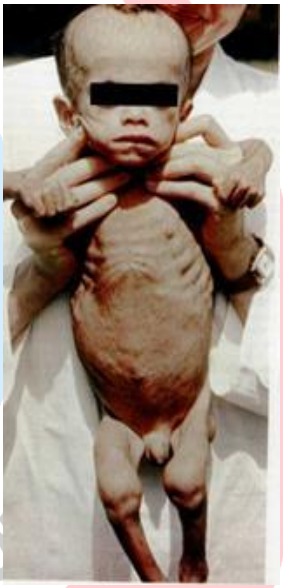
Malnutrition refers to deficiencies, excesses or imbalances in a person's intake of energy and/or nutrients.The term malnutrition covers 2 broad groups of conditions:

1. Undernutrition:which includes stunting, wasting,underweight and micronutrient deficiencies or insufficiencies (a lack of important vitamins and minerals)?
2. Overweight, obesity and diet-related non-communicable diseases (such as heart disease, stroke, diabetes and cancer).

Causes:

- Primary nutritional deficiency
- Secondaryto a disease state

Protein-energy malnutrition (PEM) figure 7-1



PEM is a potentially fatal body-depletion disorder. It is the leading cause of death in children in developing countries.
Early detection is by evaluating any child having a risk factor and interventions are given early to prevent malnutrition

Risk factors for malnutrition:

1. History of maternal malnutrition during pregnancy or exposure to toxin & drug and small inter pregnancy spacing or giving a birth weight infant
2. Tendency to bottle feeding.
3. Introduction of supplementary feeds either too early (leading to infection) or too late (leading to deprivation).
4. All chronic medical conditions e.g. liver,renal,cardiac, chest.
5. Failure of child catches up after an illness
6. Other nutrition disorders affecting the child e.g. anemia & rickets
7. Social isolation, violence & abuse.
8. Unhealthy nutritional beliefs e.g. sudden weaning of infants, starving the child during gastroenteritis.
9. The tendency to feed the child less frequently to suit mother working timing.
10. Poverty especially when it coexists with low maternal education and nutritional ignorance.
11. Developmental delay e.g. cerebral palsy.

➢ Assessment of malnourished child

I-Clinical assessment

History

Full medical history with special reference to:

- Diseases affecting the child

Birth weight and growth pattern

Dietary history:

Full dietary history should be taken to identify nutrient deficiency.

Examination

- Full exam to exclude medical conditions presented with malnutrition such as celiac disease, renal failure, and malabsorption disorders…. etc.
- Examine for other nutritional disorders e.g. vitamin & mineral deficiencies
- Assess the degree and complications of PEM

Clinically:

- The child is lacking energy or irritable, has trouble concentrating.
- Dull, thin, brittle hair.
- Bruised or scaly skin.
- Pale /swollen / bright /red tongue.
- Chronic vomiting, diarrhea or constipation.
- Frequent infections
- Short attention span

Almost all severely malnourished children are infected.

Signs of infection may be masked in severe cases. It is important that the doctors identified the site of infection.

II Anthropometry

Appropriate growth for age is the hallmark of adequate nutrition.

Poor weight gain is the earliest sign of protein Energy Malnutrition (PEM), followed by slowing of linear growth and lastly. Head circumference is the last of the 3 growth parameters to slow with chronic poor nutrition.

Assessment of the degree and duration of PEM is extremely important

Acute PEM

- Weight is disproportionately low for height and head circumference.
- Skin is loose.

Chronic PEM

- Weight, height & Head Circumference are all low
- skin changes
- Signs of Vitamin deficiency
- Hair changes (hypo pigmented areas ,dry hair)

Degree of PEM

- **Mild PEM**

Loss of fat from abdominal wall

Wt. is 75% to < 90% of expected

- **Moderate PEM**

Loss of fat from extremities
Wt. is 60% to 75% of expected

- **Severe PEM**

Loss of fat over the face (monkey face)
Wt.<60% of expected
Wt. / age <-3SD

Nutrition Management of Mild to Moderate malnutrition:

1. Nutrition education and frequent follow up
2. Increase food intake
   - Encourage frequent breast-feeding, solve any problem of lactation
   - Dietary supplementation with high caloric food to increase macronutrient intake (for those not breast fed or around 6 months).
   - Give variety of food whenever possible. If large quantities are not tolerated give small meals, snacks and nutrient dense food
   - Additional proteins above the reference for age are needed to achieve growth velocity (care must be taken if there is any risk of renal or hepatic failure).
   - Giving even small amounts of eggs, milk, meat or fish, will help the child to recover rapidly.
   - Add edible oil to the diet if possible
   - Use starch base thickener as this provides additional energy
   - Routine supplementation with a zinc and iron containing multivitamin (postpone iron therapy if there is infection)

3- Behavioral modifications
   - Support breast feeding.
   - Regularly scheduled mealtimes
   - No force feeding
   - An enjoyable atmosphere during feeding
   - Shared mealtime with other healthy children
   - The care giver should be accepted by the child; otherwise, another person may feed the child.
   - Encourage self-feeding
   - Separate mealtime from playtime & TV watching.
   - Social support
   - If oral feeding is not enough give overnight continuous enteral (Ryle tube) feeding to leave day time for establishing oral feeding

4- Identify associated diseasesand refer for treatment

➢ Follow up:

Weakly outpatient / home visits for nutrition monitoring and evaluation:

<u>1-If adequate weight gain:</u>

- Continue feeding program
- Reinforce nutrition education and follow up

2- Inadequate weight gain: May be due to:

- Inadequate caloric intake ---- give small dense meals every 2-3 hours.
- Poverty ---- social evaluation & support
- Ignorance ---- reeducate
- Psychological deprivation
- Chronic disease or infection ---- reassess the disease treatment and the diet.
- **Specific nutrient deficiency that is not corrected during rehabilitation e.g. zinc**

Treatment of severe malnutrition:

Management should be done by team members who include: physician, dietician, nurse, social worker

Objectives:

Initial treatment (Hospital treatment)

1. Resolving life threatening conditions (physician)
2. Resolving the poor nutritional status without disrupting homeostasis (dietician).
3. Starting nutritional rehabilitation when good appetite returns
4. Encourage eating & BF (all the team members)
5. Stimulate emotional & physical play
6. Education of the mother for proper care after discharge(physician & dietician)
7. Follow up (all the team members)

Treatment of other nutrient deficiencies

The physician should prescribe all vitamins and minerals in full therapeutic doses even if there are no deficiency manifestations

Criteria to start nutrition rehabilitation

1. Improved mental status
2. Improved appetite
3. Start activity, interest in the surroundings.
4. Normal temp, no vomiting, or diarrhea
5. No edema , gaining wt.> 5g /kg /day
6. No other problems that require hospital

During rehabilitation most children take between 150-200 Kcal /kg /day.

- **Protein**:1-2 g /kg /d. of high quality.
- **CHO:** 150-200 Kcal /kg /day. Use available food staples, cereals should be supplemented with animal or vegetable proteins e.g. milk or legumes.
- Ensure sufficient water intake
- Children who can eat should be given the diet every 2, 3 or 4 hours, day and night.

- If vomiting occurs, both the amount given at each feed and the interval between feeds should be reduced.
- If food is malabsorbed,increase the frequency and reduce the size of each feed
- Addition of pancreatic enzyme may be useful if there is severe malabsorption.
- Children who are unwilling to eat should be fed by NG tube.
- The child should be fed from a cup and spoon; feeding bottles should *never* be used, even for very young infants, as they are an important source of infection.
- Children who are very weak may be fed using a dropper or a syringe.

Feeding after the appetite improves

It is important to note that it is the child's appetite and general condition that determine the phase of treatment. The initial phase of treatment ends when the child becomes hungry. The child is now ready to begin the rehabilitation phase. This usually occurs after 2-7 days.

The transition should be gradual to avoid the risk ofheart failure

Heart failure can occur if children suddenly consume large amounts of feed**(Refeeding syndrome).**

Milk intolerance

Intolerance should be diagnosed *only if* copious watery diarrhea occurs promptly after milk-based feeds are begun, the diarrhea clearly improve when milk intake is reduced or stopped and it recurs when milk is given again.

Management: milk should be partially or totally replaced by yoghurt or a commercial lactose-free formula. Before the child is discharged. milk-based feeds should be given again to determine whether the intolerance has resolved.

Recording food intake

The type of feed given, the amounts offered and taken. And the date and time must be recorded accurately after each feed. If the child vomits. The amount lost should be estimated in relation to the size of the feed (e.g. a whole feed, half a feed), and deducted from the total intake.

If the daily intake is less than 80 kcal/kg, the amount of feed offered should be increased. If more than 100 kcal/kg have been given, the amount of feed offered should be reduced.

Criteria for increasing volume/decreasing frequency of feeds
• If vomiting, diarrhea more than 5 times/ day or poor appetite: continue 2 hourly feeds • If little or no vomiting, less than 5 watery stools per day and finishing most feeds: change to 3 hourly feeds • After a day on 3 hourly feeds, if no vomiting, less diarrhea, and finishing most feeds: change to 4 hourly feeds.

Vitamin D Deficiency

Causes of Vitamin D deficiency:

1. Lack of sunlight exposure
2. Too much cloud, dust vapor and smoke
3. Inadequate intake of Vitamin D
    - Breast milk content depends on maternal diet
    - Cow's milk contain 0.3-4 IU/100ml
    - Egg yolk contain 25 IU/average yolk
    - Herring fish contain 1500IU/100g
4. Improper Ca and P ratio
5. Increased requirement (during fast growth)
6. Diseases (Liver , renal diseases& Gastrointestinal diseases)
7. Drugs (egg. Antiepileptic & steroids)

Rickets

Definition

Rickets is the clinical manifestation of vitamin D deficiency in children. Rickets is a systematic disease with skeletons involved most, but the nervous system, muscular system and other system are also involved. Figure 7-2

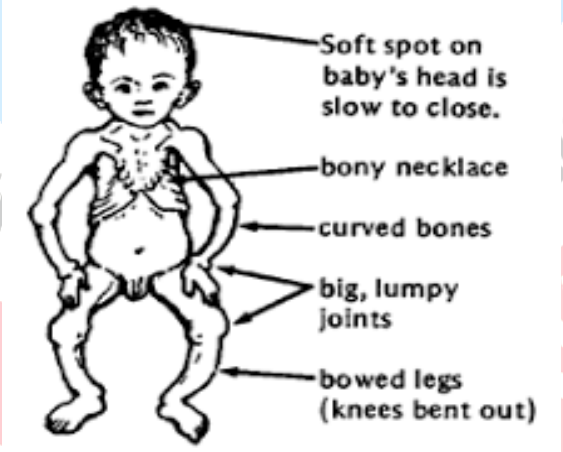


Figure 7-2 signs of Rickets

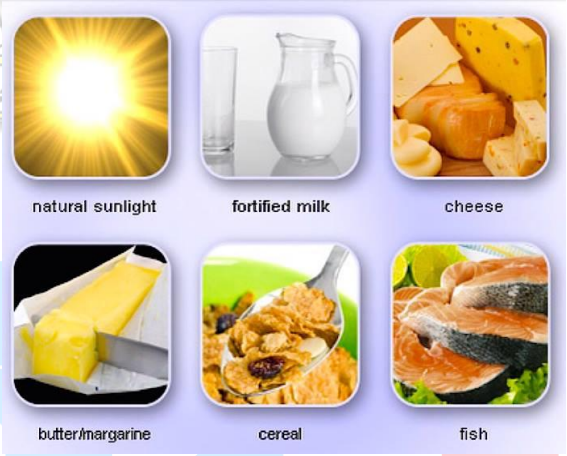
Prevention:

- Exposure to sunlight: Just 15 minutes in the sun a day is enough without glass or Sun cream.People with darker skins may need longer exposure
- Pregnant and lactating women should take adequate amount of vitamin D
- Consumption ofVitamin D rich food
- Vitamin D supplementation, if needed
- Calcium supplementation, if needed

Sources of Vitamin D figure 7-3

9. **Sunlight** is the most important source
10. **Dietary sources**:

- fortified milk &cereals
- Oily fish
- Egg yolk
- Butter
- Liver



Vitamin D Toxicity

Toxicity can cause:

- Anorexia, nausea, vomiting, weakness, nervousness, pruritis, polyuria, polydipsia (Excessive thirst), renal impairment, soft tissue calcifications
- Calcification of soft tissue, blood vessels &heart.
- Hypercalcemia :Excess blood calcium leads to stone formation in kidneys

Exercise

1. List the recommendations to avoid vitamin D deficiency.
2. List dietary sources rich in vitamin D

Anemia

Definition:

Anemia is defined as hemoglobin concentration or hematocrit below 90% or 95% of range for healthy persons. Iron status can range from iron deficiency to iron deficiency anemia

There are many types of anemia;the most common is Nutritional anemia

Nutritional Anemia, Deficiency of:

1. Iron
2. Folate
3. Vitamin B12
4. Protein
5. Copper.

Corrected by supplementation

Iron deficiency Anemia (IDA)

Iron deficiency (ID) is one of the most frequent nutrition deficiencies all round the world. Its prevalence is higher in children and childbearing age women.

Iron deficiency anemia (IDA) mainly affects child behavior and development, work performance and immunity.

Causes of iron deficiency

- Diminished intake
- Diminished absorption
- Increased demands(in fast growth periods)
- Increase losses (as intestinal helminths infestation)
- Defective metabolism

Assessment of IDA

Laboratory indices are the most common methods used to assess iron nutrition status.

Figure 7-4 Clinical features of IDA

Treatment and prevention of iron deficiency anemia:

- Investigation and treatment of the cause
- Dietary diversification: figure 7-5
  - Change meal composition to decrease the intake of inhibitors of iron absorption and to increase vitamin C rich food in meals that contain iron rich foods of plant sources
  - Increase consumption of iron rich food particularly meat and other sources of haem iron
  - Fortification of common foods
- Iron supplementation:
  - Ferrous iron salts are better absorbed than ferric forms.
  - Best absorbed on an empty stomach but if irritation occurs, give with meals
  - Generally, supplements given for 3 months (may extend to 6)

Figure 7-5 Iron rich foods

Exercise

1. List dietary factors that enhance and those inhibit iron absorption.
2. List dietary heme and non heme sources of iron

Nutritional management of infants and children with Some chronic diseases

- Early detection of chronic diseases should be undertaken by physicians
- Early nutrition intervention especially for children with chronic diseases is of utmost importance to avoid malnutrition , growth retardation and organ or system failure
- Medical nutrition Therapy should be carried out by a team including a dietitian who should follow the physician instruction for each patient.

Cardiopulmonary Disorders

The two major cardiopulmonary disorders for which children require nutritional support are **congenital heart disease** and **cystic fibrosis.**

- **CONGENITAL HEART DISEASES**

Definition:

Congenital Heart Diseases form the commonest single group of serious congenital abnormalities;they are classified to 2 major groups:

- Cyanotic congenital heart disease
- A-cyanotic congenital heart disease

Malnutrition and growth retardation are common in infants and children with congenital heart disease.

Causes of malnutrition

1. Inadequate intake due to poor appetite; excessive tiring during feeding.
2. Impaired nutrient absorption due to low gut perfusion
3. Tachycardia, Tachypnea & increase BMR
4. Excessive nutrients loss
5. Cellular anoxia stimulates secretion of cytokines.
6. Drug nutrient interaction

Goals of nutrition therapy:

1. Preserve adequate levels of all nutrients to meet the nutritional demands of the patient and preserve lean body mass
2. Reduce the work load on the heart
3. Maintain appropriate dry weight
4. Maintain optimum growth
5. Support normal feeding skill development
6. Achieve the best nutritional status possible in preparation for surgery

Key nutrition requirements:

1. The nutrient needs of pediatric patients with **mild** heart disease are similar to **normal** children.
2. The nutrient needs significantly **increased** in children with **severe** heart disease.
3. Adequate calories and proteins
4. Adequate vitamins and minerals
5. Adequate potassium to replace excess losses
6. Mild to moderate sodium restriction
7. Fluid restriction
8. A source of medium chain triglycerides for fat mal-absorption

Calories requirements:

1. Weight gain improves with **increased** caloric **by ~30%**
2. Begin to increase calories from the time of diagnosis.
3. Increase calories gradually as tolerated using high caloric formula.
4. The use of a high nutrient-density formula, reduce the amount that should be ingested.
5. Calories increase is slowly increased by 1-2 kcal/oz at a time.
6. If oral feeding cannot provide enough calories, give a slow cautious approach to enteral feeding (135-155kcal/kg).
7. For patients who need tube feeding for more than 3 months, a gastric tube is necessary.
8. Catch-up growth will occur in most children following corrective surgery for congenital heart disease so long as extra protein and energy are made available
9. Post-surgical repair calories usually decrease to normal age requirements

Protein requirements:

Increase protein requirements in:

- Patients with cardiac cachexia
- Increase protein loss in urine and stools

Micronutrient requirements:

1. The amount of electrolytes and minerals should be calculated, adjusted and monitored if caloric density of formula is increased by reducing the amounts of water during preparation,
2. Dietary supplements of Mg, K, folate and thiamine are given with the use of diuretics
3. Fat soluble vitamin supplementation is recommended in presence of malabsorption
4. Adequate iron supplementation is essential in cyanotic congenital heart disease.

5. **Sodium:** in contrast to management strategies for heart failure in adults, **sodium restriction is not recommended in infants and young children**. Why?
   Because sodium restriction can result in impaired body and brain growth and lead also to hyponatremia.

Fluid intake

- In mild cases fluid intake may not be restricted
- With progressive cardiac impairment, fluid restricted to half of the normal daily requirements is recommended

Remember
Infants and children with congenital Heart need: ➢ High caloric density formula ➢ Adequate micronutrients ➢ Sodium restriction is not recommended ➢ Small frequent meals ➢ Upright position during feeding ➢ Avoid feeding after prolonged crying or when infant is exhausted ➢ Feeding can be taken at the same time with oxygen. ➢ Feeding should not exceed 30 minutes in duration

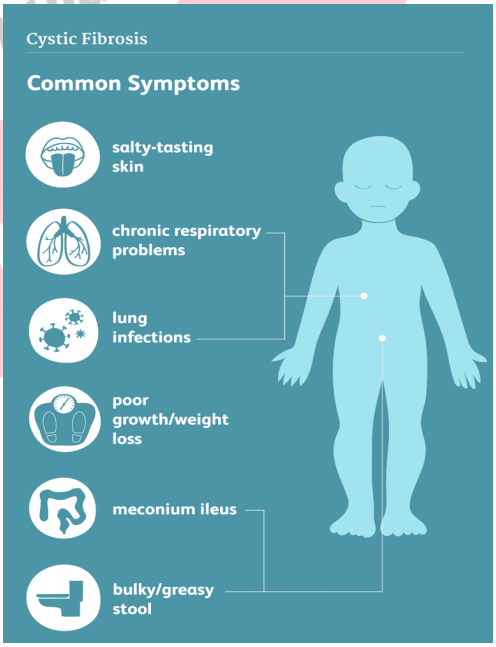
Exercise

1. List nutrition recommendations for a **malnourished** 5 years old child who is prepared for cardiac surgery.

Cystic Fibrosis

Definition

Cystic fibrosis (CF) is characterized by progressive deterioration of pulmonary and pancreatic function.Malnutrition may accelerate deterioration of pulmonary function. Figure7-6



Causes of malnutrition in CF:

1. Inadequate nutrient intake
2. Fecal losses of fat &protein,
3. Decrease appetite with progression of the disease

Goal of nutrition therapy:

Aim of medical nutrition therapy is to improve nutritional status that helps to improve muscle strength and lung function. Early intervention may prevent malnutrition and improve long-term growth.

Macronutrients requirements:

The pulmonary disease may increase nutrient requirements particularly during acute exacerbations.

- A high-protein, low-fat diet with appropriate pancreatic enzyme replacement.
- Supplemental enteral formulas of both protein and energy may be provided.
- High-fat formulas are described for patients with chronic pulmonary disease especially those who require mechanical ventilation.
- The use of appetite stimulants and human growth hormone may be effective in enhancing weight gain.
- As the disease progresses , lactose intolerance may become evident, and may require carbohydrate adjustments

Micronutrients requirements:

1. Adequate supplementation of **fat-soluble vitamins**.
2. **Sodium requirements** are **increased** because of increased losses in sweat.
3. Supplementation **of iron**, **zinc** and **magnesium** may be needed

Exercise

1. Plan a comprehensive diet menu for a 7 years old child with **cystic fibrosis**. His weight is average for his age and he has a good appetite.

Short Bowel Syndrome

Definition:

Short bowel syndrome (SBS) is characterized by alterations of gastrointestinal motility, secretion, digestion, and absorption as a result of surgical removal of a part of small intestine. Functionally, this disorder can be considered in the same way as **chronic diarrhea**.
The severity of the short bowel syndrome is related inversely to the length of the remaining intestinal segment figure 7-7

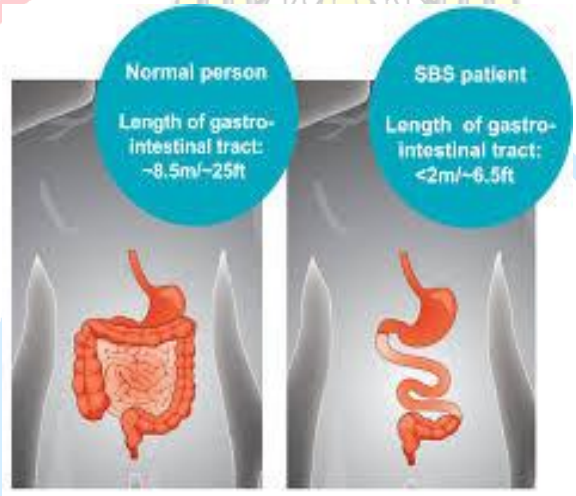


Figure 7-7 Short bowel syndrome

Goal of nutrition therapy:
The aim of nutrition therapy is to prevent nutrient deficiency resulting from removal of specific segments of intestine.

Nutrition problems that result from removal of specific segments of intestine:

- Removal of the jejunum results in more severe carbohydrate malabsorption and perhaps in decreased biliary and pancreatic secretions, as well as deranged motility.
- Resection of Ileum, results in loss of both bile salt uptake and absorption of vitamin B12.

Nutrition support:

1. **Parenteral nutrition is required i**n the early phase, immediately after massive resection and the early part of the intermediate phase.
2. **Enteral intake** must proceed slowly.
3. Continuous feeding through either an **nasogastric tube or a gastrostomy** tube is better tolerated during the early phase than is bolus feeding

4. **For infants**, early use of breast milk or amino acid–based formulas, particularly those supplemented with glutamine or long-chain fatty acid, are recommended.
5. Elemental formulas generally are better tolerated than non-elemental formulas.
6. Frequent small feedings are recommended.
7. Pharmacologic therapy may provide symptomatic and physiologic improvement.

Exercise

1. Plan a comprehensive diet menu for a 5 years old child with **chronic diarrhea.**

Chronic Kidney Disease (CKD)

Definition:
Chronic kidney disease (CKD) is a condition characterized by a gradual loss of kidney function over time.

Decreased nutritional intake as a result of poor appetite is common in children with CKD. Maintenance of nearly normal linear growth can be achieved if adequate intake of energy and protein can be maintained.

Goal of nutrition therapy:
Nutritional management of CKD in children must ensure:

- Sufficient intake of energy and protein for basal needs and proper growth.
- Restricting the load of water and nitrogen that must be excreted by damaged or dysfunctional kidneys or removed by renal replacement therapy.

Energy requirements of CKD children are similar to those of normal children.
Protein requirements

1. during hemodialysis, protein exceed those for normal children by 33% to 50%
2. For peritoneal dialysis, protein exceeds those for normal children by 50% to 100%.

Micronutrients:

1. Dietary **phosphate** should be restricted to avoid development of renal bone disease.
2. Avoid excessive administration of **vitamin A**.

Exercise

1. List dietary recommendations for children with CKD on hemo dialysis.
2. What are the foods rich in phosphate that should be avoided in CKD.

Feeding the child with liver disease

Nutrition management is dependent on whether the presenting liver disease is acute, chronic, or caused by an inborn error of metabolism.

Goal of nutrition management:

- Optimal nutrition is important in preventing further damage to the liver, promotes growth, improves immunological status, and maximizes the success of liver transplantation.
- Modified formulas and dietary supplements are needed for optimal nutrition in infants and children with Chronic liver disease (CLD)

Assessment of children with CLD:

1. Anthropometry

Weight alone is a poor indicator of nutrition status in patients where ascites and organomegaly.

Linear growth is a good indicator of long-term nutrition

Serial measurements of mid upper arm circumference (MUAC) and tricep skin folds (TSF) using standard technique can be used to calculate arm muscle area, which reflects muscle mass and is sensitive to nutrition status

2. Dietary assessment

This includes the ability of the child to feed and, social and cultural issues that affect the family's ability to administer and comply with a complex dietary regime.

Nutrition requirements

Total energy

Estimated energy requirements (EER) in infants < 12 months with CLD can be up to 150% of the nutrient reference value (NRV) for energy for age, or initially 120–150 kcal/kg.

Carbohydrate:

Infants and children with chronic liver disease are at increased risk of **fasting hypoglycemia which needs:**

- Continuous or smaller more frequent feeds
- Emergency regime for intravenous dextrose provision

Fat:

- Medium-Chain Triglyceride (MCT) supplementation is commonly required to maintain growth.
- Between 30% and 70% of fat should be provided as MCT.
- 10% total energy should be provided as PUFA to avoid deficiency of EFA

- For exclusively formula-fed infants, 0.7 mL walnut oil is recommended for every (100 kcal) of a 50% MCT-containing formula.
- Older children can improve their EFA intake by adding other dietary sources to their diets, for example, canola, sunflower, and soybean oils. Fish oil and egg yolk are also good sources of long chain poly unsaturated FA (LCPUFA).
- Regular supplementation and monitoring of Fat-soluble vitamins is required

Protein:

CLD alters amino acid metabolism, lowering blood levels of branched-chain amino acids (BCAA) and elevating levels of aromatic amino acids. The use of BCAA is not yet evidenced; moreover, it is limited by cost and palatability.

Feeding plan for infants with CLD

Oral feeding

a) All infants should be encouraged to feed orally, unless they are unable to meet their energy needs, to maintain growth.
b) If growth is affected and bile flow is compromised, then an MCT-containing formula is required.
c) A breastfed infant should be offered an MCT-containing formula as complementary feeds.
d) A bottle-fed infant should grade over from standard infant formula to an MCT-containing formula.
e) If the addition of an MCT-containing formula has not improved growth, then consider fortifying the formula to improve energy and nutrient intake to meet growth requirements.
f) The introduction of solids is essential to support the development of oral feeding skills. Exposure to solids at 6 months is encouraged, even if the child is not hungry and might only taste small amounts.
g) Promote a positive oral experience and socialization around food, and encourage as rapid progression in texture as possible. If significant amounts are taken, consider adding extra energy to solids as PUFA, MCT emulsion, or MCT oil.
h) If weight is static for up to 3 weeks or the child begins to cross percentiles in a downward direction, or oral intake in an infant is < 120 mL/kg of a fortified formula, then NG feeding is indicated.

Enteral feeding

a) If NG feeds are indicated, 50% energy efficiency ratio (EER) should be provided overnight as continuous feeds over 10–12 h and the infant allowed to drink during the day.
b) As CLD progresses, it might be necessary to feed the infant continuously for 20–24 h for best tolerance and nutrient absorption.
c) If vomiting is an issue, continuous nasojejunal feeding might be required.

Parenteral nutrition

Only when enteral nutrition is not possible or ineffective,parenteral nutrition (PN) should be considered.

Post liver-transplant nutrition

- Feeding child post-transplant should start as soon as possible, within the first 72 h.
- Clear fluids followed by full fluids and a normal full ward diet
- Food safety should be applied all the times.
- If the child was fed MCT-containing feed pretransplant, then this should be continued.
- NG feeding at the time of transplant for up to 2 months is usually needed.
- **A normal healthy diet** for age should be encouraged.
- **Small, frequent snacks and favorite foods might be used initially to improve intake.**
- **Grapefruit and its juice are the only dietary restrictions, due to interaction with drugs.**
- **Prolonged diarrhea** should be investigated.
- **New food allergies** can develop post-transplant, and dietary management might be required.

Useful websites

1. Pediatric Nutrition in Practice 2nd, revised edition

   https://www.karger.com/Book/Home/261574.
2. Infant-Child-and-Adolescent-Nutrition-A-Practical-Handbook
   https://www.crcpress.com/

PART VIII

Nutrition in Aging

The Older Population

Gerontology & Geriatrics

Nutrition in Health Promotion and Disease Prevention

Physiologic Changes

Nutrition Screening and Assessment

Nutrition Needs

Useful Websites

Mona Hegazy, MD

THE OLDER POPULATION

Definition

Aging is a normal biologic process. However, it involves some decline in physiologic function. Qualifying as an "older adult" is based on the minimum eligibility age of 65 in many federal programs. Those aged 65 to 74 are the **young old**; 75 to 84, **old**; and 85 or older, **oldest old**.

GERONTOLOGY &GERIATRICS

Gerontologyis the study of normal aging, including factors in biology, psychology, and sociology.

Geriatrics is the study of the chronic diseases frequently associated with aging, including diagnosis and treatment.

Figure -1 physically active old age

NUTRITION IN HEALTH PROMOTION AND DISEASE PREVENTION

In aging adults, nutrition care is not limited to disease management or medical nutrition therapy but has broadened to have a stronger focus on healthy lifestyles and disease prevention.

They want to know how to:

- Eat healthier

- Exercise safely
- Stay motivated

Nutrition may include three types of preventive services:

1. Primary prevention, the emphasis is on nutrition in health promotion and disease prevention. Pairing healthy eating with physical activity is equally important.
2. Secondary prevention involves risk reduction and slowing the progression of chronic nutrition-related diseases to maintain functionality and quality of life.
3. Tertiary prevention, care/case management and discharge planning often involve chewing and appetite problems, modified diets, and functional limitations.

PHYSIOLOGIC CHANGES with aging

- Organs change with age. The rates of change differ among individuals and within organ systems. It is important to distinguish between normal changes of aging and changes caused by chronic disease such as atherosclerosis.

- Factors such as genetics, illnesses, socioeconomics, and lifestyle determine how aging progresses for each person.

❖ **Body Composition**: Body composition changes with aging. Fat mass and visceral fat increase, whereas lean muscle mass decreases. **Sarcopenia**, the loss of muscle mass, strength, and function, can be age related and can significantly affect an older adult's quality of life by:

1. Decreasing mobility
2. Increasing risk for falls
3. Altering metabolic rates

Sarcopenic obesity: is the loss of lean muscle mass in older persons with excess adipose tissue. Together the excess weight and decreased muscle mass exponentially compound to further decrease physical activity, which in turn accelerates sarcopenia.

❖ **Taste and Smell Sensory losses**: affect people to varying degrees, at varying rates, and at different ages. Age-related alterations to the sense of taste, smell, and touch can lead to:

1. Poor appetite
2. Inappropriate food choices
3. Low nutrient intake

❖ **Hearing loss**, some vitamins may play a part in hearing loss

1. Vitamin B12
2. Vitamin D

❖ **Vision changes**

1. Age-related macular degeneration (AMD)
2. Glaucoma
3. Cataract

A diet high in antioxidants, such as beta carotene, selenium, resveratrol, zinc, and vitamins C and Eis beneficial

❖ **Immuno-competence** declines with age, immune response is slower and less efficient. Maintaining good nutritional status promotes good immune function.

❖ **Gastrointestinal (GI) changes**

1. Tooth loss, use of dentures, and xerostomia (dry mouth) can lead to difficulties in chewing and swallowing
2. GI changes can negatively affect a person's nutrient intake:
3. Dysphagia
4. Decreased gastric mucosal function
5. Achlorhydria is the insufficient production of stomach acid
6. Gastritis
7. Constipation

Leading to the following nutrient deficiency:

a) Calcium
b) Zinc
c) Vitamin B12

❖ **Cardiovascular disease (CVD) changes**

1. Heart disease
2. Hypertension
3. Cerbro-vascular stroke

❖ **Neurologic processes**

1. Cognition
2. Steadiness
3. Reaction time
4. Coordination
5. Gait
6. Sensations
7. Memory difficulties
8. Depression

Functionality and functional status

It is the ability to perform self-care, self-maintenance, and physical activities, correlates with independence and quality of life.

Many nutrition-related diseases affect functional status in older individuals. Inadequate nutrient intake may hasten loss of muscle mass and strength, which can have a negative effect. Among the older adults who have one or more nutrition-related chronic diseases, impaired physical function may cause greater disability, with increased morbidity, nursing home admissions, or death.

Frailty and Failure to Thrive

It includes; impaired physical functioning, malnutrition, depression, and cognitive impairment. Symptoms include:

1. Weight loss
2. Decreased appetite
3. Poor nutrition
4. Dehydration
5. Inactivity
6. Impaired immune function.

NUTRITION SCREENING AND ASSESSMENT

The physical and metabolic changes of aging can yield inaccurate results of the use of traditional nutrition assessment tools, examples are anthropometric measurements: height and weight, and BMI (With aging, fat mass increases and height decreases as a result of vertebral compression)

The Mini Nutritional Assessment (MNA) includes two forms: a screening Short Form (MNA-SF) and the full assessment. The validated MNA-SF is the most widely used screening method to identify malnutrition in noninstitutionalized older adults. It includes six questions and a body mass index (BMI) evaluation, or a calf circumference if a BMI is not possible. The MNA-SF is being used as a screening assessment tool in long-term care and is especially useful in the short stay units.

NUTRITION NEEDS

Nutrient Needs Change with Aging: figure -2

1. **Energy**: basal metabolic rate decreases with age because of changes in body composition. Energy needs decrease 3% per decade in adults.

Must encourage nutrient-dense foods in amounts appropriate for caloric needs.

2. **Protein:** 0.8 g/kg minimum. Requirements vary with chronic disease, decreased absorption, and synthesis.
   Protein intake should not be routinely increased; excess protein could unnecessarily stress aging kidneys.

3. **Carbohydrates**: 45%-65% total calories
   Men 30 g fiber& Women 21 g fiber, Constipation may be a serious concern for many.
   Emphasize complex carbohydrates: legumes, vegetables, whole grains, and fruits to provide fiber, essential vitamins, and minerals. Increase dietary fiber to improve laxation especially in older adults.

4. **Lipids:** 20%-35% total calories. Overly severe restriction of dietary fats alters taste, texture, and enjoyment of food; can negatively affect overall diet, weight, and quality of life.
   Emphasize healthy fats rather restricting fat.

5. **Vitamins and minerals:**Understanding vitamin and mineral requirements, absorption, use, and excretion with aging has increased but much remains unknown.
   Encourage nutrient-dense foods in amounts appropriate for caloric needs.

a) **Vitamin B12:**2.4 mg daily, risk of deficiency increases because of low intakes of vitamin B12, and decline in gastric acid, which facilitates B12 absorption. Those 50 and older should eat foods fortified with the crystalline form of vitamin B12 such as in fortified cereals or supplements
b) **Vitamin D:** 600-800 IU daily, risk of deficiency increases as synthesis is less efficient; skin responsiveness as well as exposure to sunlight decline; kidneys are less able to convert D3 to active hormone form.
   As many as 30%-40% of those with hip fractures are vitamin D insufficient. Supplementation may be necessary.
c) **Folate**: 400 µg daily, deficiency may lower homocysteine levels; possible risk marker for atherothrombosis, Alzheimer's disease, and Parkinson's disease Fortification of grain products has improved folate status. When supplementing with folate, must monitor B12 levels
d) **Calcium** 1200 mg daily, dietary requirement may increase because of decreased absorption; only 4% of women and 10% of men age 60 and older meet daily recommendation from food sources alone. Recommend naturally occurring and fortified foods. Supplementation may be necessary.

e) **Potassium**: 4700 mg daily, potassium-rich diet can blunt the effect of sodium on blood pressure. Recommend meeting potassium recommendation with food, especially fruits and vegetables.

f) **Sodium**: 1500 mg daily, risk of hypernatremia caused by dietary excess and dehydration, risk of hyponatremia caused by fluid retention.

g) **Zinc:** Men 11 mg Women 8 mg daily, low intake associated with impaired immune function, anorexia, loss of sense of taste, delayed wound healing, and pressure ulcer development. Encourage food sources: lean meats, oysters, dairy products, beans, peanuts, tree nuts, and seeds

6. **Water:** Dehydration causes decreased fluid intake, decreased kidney function, and increased losses caused by increased urine output from medications (laxatives, diuretics).
Symptoms: electrolyte imbalance, altered drug effects, headache, constipation, blood pressure change, dizziness, confusion, dry mouth and nose
Dehydration is often unrecognized; it can present as falls, confusion, change in level of consciousness, weakness or change in functional status, or fatigue.

Encourage fluid intake of at least 1500 ml/day or 1 ml per calorie consumed. Risk increases because of impaired sense of thirst, fear of incontinence, and dependence on others to get beverages.

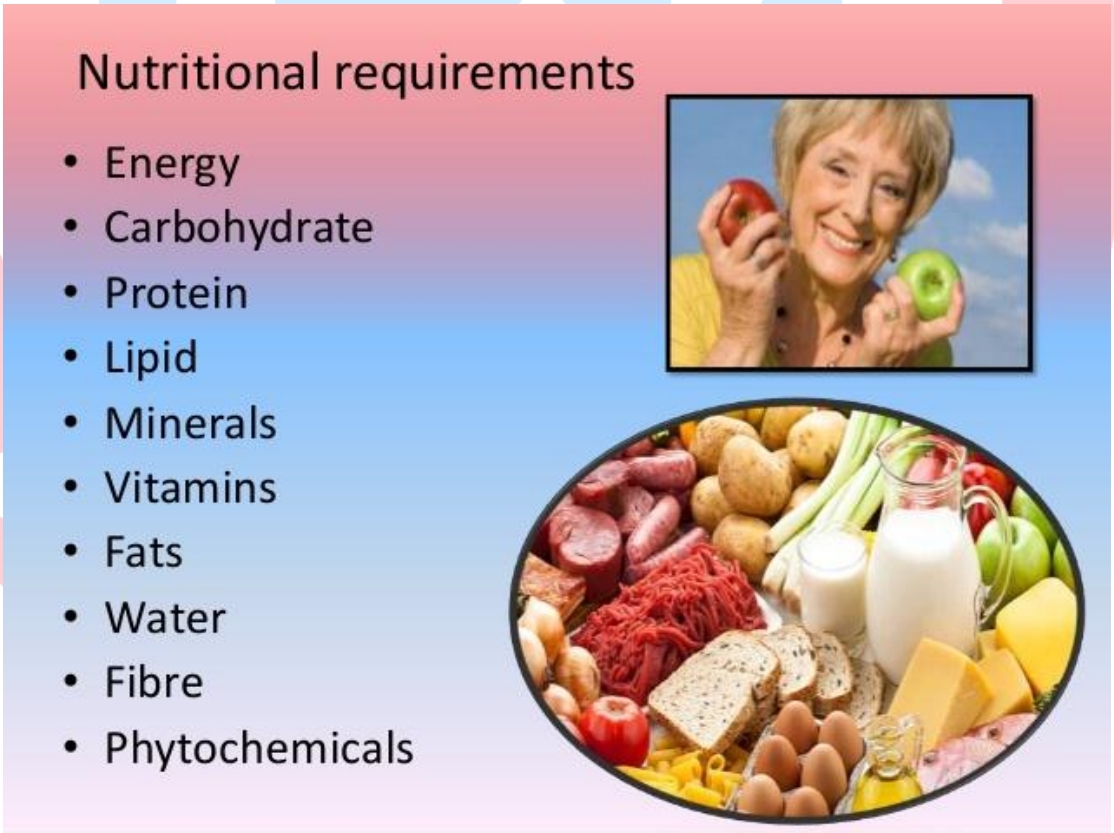


Figure -2 nutrition needs in old age

Dietary Guidelines for old people

1. **Maintain calorie balance** over the lifetime to achieve and sustain a healthy weight. Healthy eating patterns limit intake of sodium, solid fats, added sugars, and refined grains. Increased physical activity and reduced time spent in sedentary behaviors are also desired.

2. **Focus on consuming nutrient-dense foods** and beverages.
    a) A healthy eating pattern emphasizes nutrient-dense foods and beverages. Select fat-free or low-fat milk and milk products, seafood, lean meats and poultry, eggs, beans and peas, and nuts and seeds.
    b) Choose vegetables, fruits, whole grains, and milk and milk products for more potassium, dietary fiber, calcium, and vitamin D as nutrients of concern.
    c) Eat a variety of vegetables, especially dark-green and red and orange vegetables, beans and peas.
    d) Consume at least half of all grains as whole grains.

3. **Nutrient needs should be met primarily through consuming foods**.
    a) When needed, fortified foods and dietary supplements may be useful in providing one or more nutrients that otherwise might be consumed in less than recommended amounts.
    b) Consume foods fortified with vitamin B12, such as fortified cereals, or dietary supplements.

4. **A healthy eating pattern should prevent foodborne illness**.
    a) Four basic food safety principles (Clean, Separate, Cook, and Chill) work together to reduce the risk of foodborne illnesses.
    b) Some foods (such as milks, cheeses, and juices that have not been pasteurized and undercooked animal foods) pose high risk for foodborne illness and should be avoided.

5. **If alcohol is consumed, it should be consumed in moderation**—up to one drink per day for women and two drinks per day for men—and only by adults of legal drinking age.

6. **Individuals should meet the following recommendations** as part of a healthy eating pattern while staying within their calorie needs:

a) Increase their intakes of whole grains, dark green and orange vegetables, legumes, and milk
b) Choose more nutrient-dense forms of foods, that is, foods low in solid fats and free of added sugars
c) Lower their intake of sodium and saturated fat.

Remember

PHYSIOLOGIC CHANGES with aging:

1. Body Composition
2. Taste and Smell Sensory losses
3. Hearing loss
4. Vision changes
5. Immuno-competence
6. Gastrointestinal (GI) changes
7. Cardiovascular disease (CVD) changes
8. Neurologic processes

NUTRITION NEEDS

- **Energy**
- **Protein**
- **Carbohydrates**
- **Lipids**
- **Vitamins and minerals**
  1. Vitamin B12
  2. Vitamin D
  3. Folate
  4. Calcium
  5. Potassium
  6. Sodium
  7. Zinc
- **Water**

Useful Websites

1. American Geriatrics Society
   http://www.americangeriatrics.org
2. American Society on Aging
   http://www.asaging.org/

Book Coordinator ; Mostafa Fathallah

General Directorate of Technical Education for Health

Good Luck