Nutrition in Health and Disease course

15 hours, 1 credit.

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References:

1. Key references: A. Catherine Ross, Benjamin Caballero, Robert J. Cousins, Katherine L. Tucker, and Thomas R. Ziegler (Eds.). Modern Nutrition in Health and Disease. 11th Edition. Wolters Kluwer Health/Lippincott Williams & Wilkins, 2014.
2. Useful references:
    a. World Health Organization (WHO) – Nutrition guidelines and fact sheets: https://www.who.int/health-topics/nutrition
    b. Centers for Disease Control and Prevention (CDC) – Nutrition: https://www.cdc.gov/nutrition/
    c. Harvard T.H. Chan School of Public Health – The Nutrition Source: https://www.hsph.harvard.edu/nutritionsource/
    d. British Nutrition Foundation (BNF): https://www.nutrition.org.uk/
    e. American Society for Nutrition (ASN) – Nutrition Reviews & AJCN journal highlights: https://nutrition.org/
    f. The Lancet – Nutrition Series (review articles): https://www.thelancet.com/series/nutrition
    g. Journal of the Academy of Nutrition and Dietetics (Practice guidelines and reviews): https://www.jandonline.org/

COURSE CONTENT

Week	Hour	Date	Topic
1	2		Introduction to Nutrition, Health, and Disease
2	2		Foundations of a Healthy Diet
3	2		Nutrition and the Immune System
4	2		Nutrition and Oxidative Stress
5	2		Obesity: Epidemiology & Prevention
6	2		Obesity Management & Bariatric Surgery
7	2		Nutritional Management of Diabetes Mellitus
8	2		Metabolic Syndrome & Insulin Resistance
9	2		Nutrition & Inflammatory Processes
10	2		Nutrition & Cardiovascular Disease
11	2		Nutrition & Cancer
12	2		Nutrition in Gastrointestinal Diseases
13	2		Nutrition & Kidney Disorders
14	2		Functional Foods, Nutraceuticals & Supplements

15	2		Nutrition in Surgery and Trauma

Module 1: Foundations of Health and Nutrition.

a. Definition of Health, Public Health and Nutrition.
b. How the disease occurs? Natural history of disease & Risk factor
c. Determinants of health & responsibility of health.
d. Why study nutrition & health?

Introduction:

Health is a common subject in most cultures. The World Health Organization's definition of health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" is rich and multifaceted. Let's break it down for further understanding:

1. Physical Well-being:

Refers to the optimal functioning of your body systems, including the cardiovascular, respiratory, digestive, immune, and musculoskeletal systems. This encompasses:

- Having enough energy to perform daily activities and cope with stress.
- Maintaining a healthy weight and body composition.
- Experiencing quality sleep that refreshes and revitalizes.
- Avoiding major illnesses and injuries.

2. Mental and Emotional Well-being:

- Encompasses a positive state of mind characterized by:
  - Emotional stability and resilience to cope with challenges.
  - Positive self-esteem and a sense of purpose.
  - Ability to build and maintain healthy relationships.
  - Freedom from mental health illnesses like depression, anxiety, or addiction.

3. Social Well-being:

- Focuses on our connection with others and our interactions within communities. It includes:
  - Having strong social support networks for emotional and practical assistance.
  - Feeling a sense of belonging and security within your community.
  - Contributing positively to society and feeling valued.
  - Engaging in meaningful relationships and activities.

Important Additional Points:

- Dynamic and Holistic: Health is not a static state but a dynamic process constantly influenced by internal and external factors. It's a continuum, meaning you can move along the spectrum, experiencing high or low levels of health in different aspects.

- Positive Emphasis: The WHO definition emphasizes health as a resource for everyday life, not just the absence of disease. It highlights the importance of personal and social resources in maintaining and promoting well-being.
- Individual and Population Health: This definition applies to both individuals and populations. We strive for individual health, but achieving overall population health requires addressing social determinants of health and creating environments that support healthy choices for all.

Understanding the multidimensional nature of health empowers us to make informed choices and advocate for policies that promote well-being in all its aspects.

Public health:

Public health is the "art and science of preventing disease, prolonging life and promoting health through the organized efforts of society" (Acheson, 1988; WHO).

This work is achieved by promoting healthy lifestyles, researching disease and injury prevention, and detecting, preventing and responding to infectious diseases. Overall, public health is concerned with protecting the health of entire populations. These populations can be as small as a local neighborhood, or as big as an entire country or region of the world.

Public health work spans government, business and nonprofit sectors. Here are some examples of public health professionals: Restaurant inspectors, health educators, community health workers, scientists and researchers, nutritionists, social workers, epidemiologists, public health physicians and nurses, occupational health and safety professionals, policymakers, biostatisticians, ...etc.

Disease:

Any bodily abnormality or failure to function properly, except that resulting directly from physical injury.

- Bodily Abnormality:

Diseases often involve structural anomalies that deviate from the normal physiological state. A clear example is congenital heart defects in newborns. In cases where the heart develops abnormally during fetal growth, the structural abnormality can lead to conditions like ventricular septal defects, impacting the heart's ability to function properly.

- Failure to Function Properly:

Moving to the functional aspect, consider Type 2 diabetes. In this condition, the body fails to regulate blood sugar effectively, leading to hyperglycemia. The pancreas may not produce sufficient insulin, or the body's cells may resist insulin's effects, resulting in a failure of the normal glucose regulation process.

- Exclusion of Physical Injury:

An example illustrating the exclusion of physical injury is a broken bone. While a broken bone involves a clear bodily abnormality, it directly results from a physical injury. In contrast, conditions like osteoporosis, where bones weaken over time, represent bodily abnormalities not directly caused by a traumatic event.

- Subjectivity and Specific Examples:

The term "abnormality" introduces subjectivity, making it important to consider specific examples. An example of a subjective abnormality is psychological conditions like anxiety disorders. What may be considered abnormal anxiety levels can vary between individuals and cultures, highlighting the nuanced nature of mental health conditions.

- Holistic Understanding of diseases:

To provide a more holistic understanding, let's consider hypertension. Hypertension involves both structural changes in blood vessels (abnormality) and a failure of the cardiovascular system to maintain optimal blood pressure. This example emphasizes how diseases often manifest through an interplay of structural and functional factors.

How the diseases occur?

1. **Old View: Germ Theory of Disease:**

The Germ Theory of Disease, proposed by scientists such as Louis Pasteur and Robert Koch in the late 19th century, revolutionized our understanding of how diseases occur. According to this theory, infectious diseases are primarily caused by microorganisms, specifically bacteria and viruses. Microorganisms, referred to as germs, are seen as the direct and sole agents responsible for causing diseases. The theory emphasizes the importance of preventing the transmission of these germs to control and eradicate diseases. Key principles include the idea that each specific disease is associated with a specific pathogenic microorganism, and preventing the spread of these microorganisms can prevent the corresponding diseases.

2. **New View of disease occurrence: Epidemiological Triad:**

The Epidemiological Triad represents a more contemporary and comprehensive approach to understanding the occurrence of diseases. Instead of focusing solely on infectious agents, this model considers three interconnected components: the host, the environment, and the agent. The Epidemiological Triad recognizes that the interaction between these three factors plays a crucial role in the development and spread of diseases.

Host: The individual's susceptibility and response to the disease. Factors such as age, genetics, and immune status contribute to the host's vulnerability.

Agent: The infectious microorganism or other factors (e.g., toxins, chemicals) that cause the disease. This component considers a broader range of causative agents beyond just microorganisms.

Environment: The external factors that influence the host and the agent. Environmental conditions, socio-economic factors, and lifestyle choices contribute to the context in which diseases occur.

Illness and sickness

The concepts of illness and sickness are often used in the field of medical sociology to distinguish between subjective and social aspects of experiencing a health condition.

Illness:

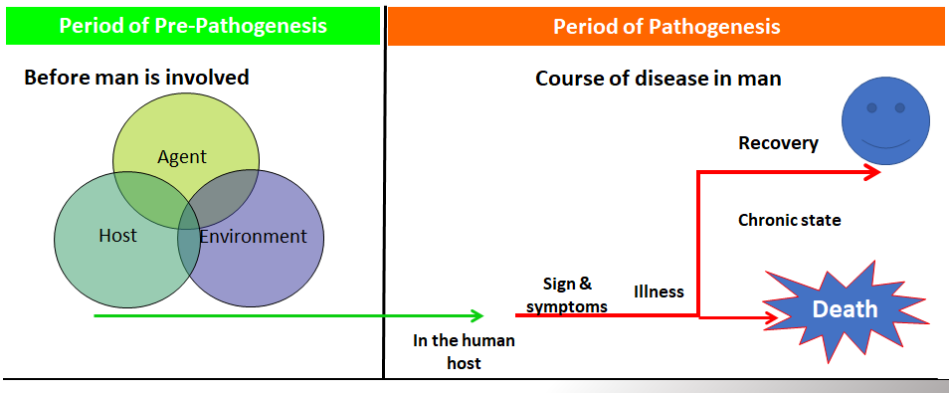
"Illness" refers to the subjective state of an individual who is aware of not being well. It is a personal and internal experience that encompasses the physical, emotional, and psychological aspects of feeling unwell. Illness is often characterized by symptoms, discomfort, and a sense of being unwell. This term focuses on the individual's perception of their health and how they personally experience and interpret their symptoms.

Sickness:

On the other hand, "sickness" goes beyond the individual's subjective experience and introduces a social dimension. Sickness is viewed as a state of social dysfunction or a role that an individual assumes when they are ill. This concept involves how the individual's illness affects their interactions with society and the expectations and behaviors associated with being unwell. The "sickness role" refers to the societal expectations and behaviors attributed to someone who is experiencing illness, such as taking time off work or seeking medical attention.

Natural History of Disease

The natural history of disease refers to the progression of a disease over time in the absence of medical intervention. It involves understanding the course of a disease from its inception, through various stages, to its resolution, chronicity, or sometimes death. This concept is crucial in epidemiology, public health, and clinical medicine for predicting disease patterns, identifying opportunities for intervention, and developing preventive strategies. The natural history of disease typically consists of several stages:



1. **Prepathogenesis Stage:**

This stage involves factors that predispose individuals to a disease but don't guarantee its occurrence.

Risk factors, such as genetic predisposition, environmental exposures, and lifestyle choices, play a role.

2. **Pathogenesis Stage:**

This stage marks the onset and development of the disease. It includes the interaction between the host, the agent (cause of the disease), and the environment.

Sub-stages may include the incubation period, during which the disease develops without apparent symptoms.

3. **Clinical Disease Stage:**

Symptoms become noticeable, and individuals seek medical attention.

The disease progresses through its clinical phases, and the severity and duration vary based on the specific disease.

4. **Resolution or Chronic Disease Stage:**

The disease may resolve on its own, indicating a successful immune response or clearance of the agent. In some cases, the disease becomes chronic, with long-term symptoms or periodic relapses.

5. **Death Stage:**

In certain instances, the natural history concludes with death, particularly in severe or untreated diseases.

Understanding the natural history of a disease helps healthcare professionals, researchers, and policymakers implement effective preventive measures and interventions at various stages. For example:

- Primary Prevention: Interventions to prevent the disease before it occurs. This often involves addressing risk factors or promoting protective behaviors.
- Secondary Prevention: Early detection and prompt treatment during the preclinical or early clinical stages to minimize the impact of the disease.
- Tertiary Prevention: Strategies to reduce the complications and disabilities associated with chronic diseases, improving the quality of life for individuals living with them.

Risk Factors:

Risk factors are characteristics or exposures that increase the likelihood of developing a particular disease or condition. They contribute to the probability of disease occurrence and can be classified into two main categories: modifiable and non-modifiable.

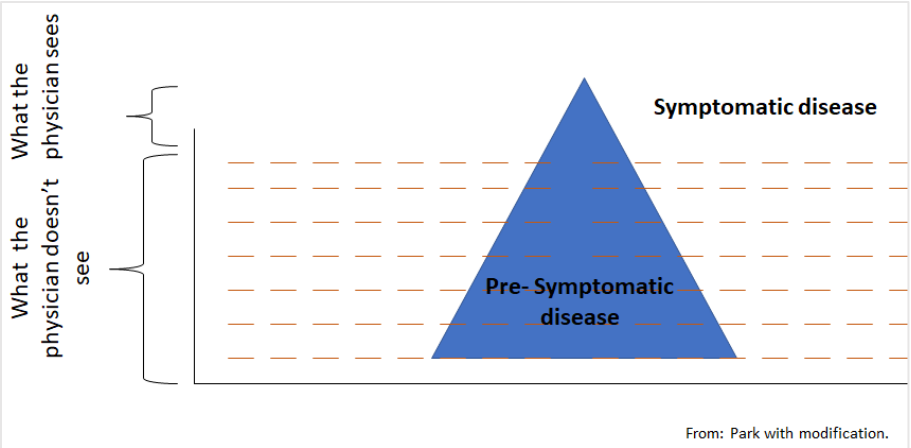
1. **Non-Modifiable Risk Factors:**

    - Age: As individuals age, the risk of certain conditions, such as cardiovascular diseases and certain types of cancer, tends to increase.
    - Gender: Some diseases have a higher prevalence in one gender over another. For instance, prostate cancer is more common in males, while breast cancer is more prevalent in females.
    - Genetics/Family History: Genetic predisposition can significantly influence the risk of diseases like diabetes, certain types of cancer, and cardiovascular disorders.
2. **Modifiable Risk Factors:**
    - Smoking/Tobacco Use: Smoking is a major modifiable risk factor for various health conditions, including lung cancer, cardiovascular diseases, and respiratory disorders.
    - Poor Diet and Physical Inactivity: Unhealthy dietary patterns and sedentary lifestyles contribute to conditions like obesity, type 2 diabetes, and cardiovascular diseases.
    - Excessive Alcohol Consumption: Heavy alcohol consumption increases the risk of liver diseases, certain cancers, and cardiovascular issues.
    - High Blood Pressure (Hypertension): Elevated blood pressure is a modifiable risk factor for stroke, heart disease, and kidney problems.
    - Unsafe Sexual Practices: Engaging in unprotected sex or having multiple sexual partners increases the risk of sexually transmitted infections (STIs).
    - Stress: Chronic stress can contribute to various health issues, including mental health disorders, cardiovascular problems, and compromised immune function.

Understanding and addressing modifiable risk factors is crucial in preventive medicine. Public health interventions and individual lifestyle modifications can target these factors, leading to a reduction in the incidence and burden of many diseases. Non-modifiable risk factors, while important for risk assessment, may not be amenable to direct intervention. Therefore, focusing on modifiable factors provides actionable opportunities for health promotion and disease prevention

Iceberg of the Disease

The Iceberg Model of Disease is a metaphorical representation that illustrates the concept that only a fraction of the total disease burden is visible or clinically apparent, while a larger portion remains hidden or subclinical. The model is named after the shape of an iceberg, where the tip represents the observable or diagnosed cases, and the submerged part signifies the undetected or subclinical cases.



This model is fundamental in epidemiology and public health for understanding the true extent of a health issue within a population. Here's a breakdown of the components of the iceberg model:

1. **Tip of the Iceberg (Clinical Cases):**

The visible part represents diagnosed and clinically evident cases of a disease.

These are individuals who have sought medical attention, received a diagnosis, and may be receiving treatment.

2. **Submerged Part (Subclinical Cases):**
   - The larger portion beneath the waterline symbolizes cases that go undetected or are subclinical, meaning individuals may not display noticeable symptoms or seek medical care.
   - Subclinical cases may include individuals with mild symptoms, asymptomatic carriers, or those in the early stages of the disease.

Reasons for Submersion:

- Asymptomatic Cases: Some individuals may carry the disease but show no symptoms, making it challenging to identify them without widespread screening.
- Mild Symptoms: Cases with mild or nonspecific symptoms may not prompt individuals to seek medical attention, leading to underreporting.
- Lack of Awareness: In some instances, individuals may be unaware of their condition, contributing to the undetected cases.

Public Health Implications of iceberg model of disease:

- Preventive Strategies: The iceberg model underscores the importance of preventive measures to target not only diagnosed cases but also the larger pool of subclinical cases.
- Screening Programs: Systematic screening and surveillance efforts are critical for identifying and addressing subclinical cases, helping prevent the further spread of the disease.
- Public Health Planning: Understanding the full extent of the disease burden, including subclinical cases, is essential for effective public health planning and resource allocation.

Application iceberg model of disease to Various Diseases:

- The iceberg model is applicable to a range of health issues, from infectious diseases like COVID-19 to chronic conditions like diabetes.
- It highlights the significance of comprehensive strategies that consider both diagnosed and undetected cases.

Determinants of health:

The determinants of health are various factors and conditions that influence an individual's health status and well-being. These determinants can be categorized into several key domains, each playing a role in shaping health outcomes. Here's a brief description of the determinants you've mentioned:

1. **Heredity:**

Heredity refers to the genetic factors passed down from parents to offspring. Genetic makeup can influence susceptibility to certain diseases and conditions.

2. **Environment:**

Environmental determinants encompass the physical, social, and cultural surroundings in which individuals live and work. Factors such as air and water quality, housing conditions, and access to green spaces impact health.

3. **Lifestyle:**

Lifestyle choices encompass individual behaviors and habits, including diet, physical activity, substance use, and sleep patterns. Healthy lifestyle choices contribute to overall well-being and help prevent various diseases.

4. **Socioeconomic (SE) Conditions:**

Socioeconomic determinants involve social and economic factors that influence health outcomes. Income, education, employment, and social status play significant roles in determining access to resources and healthcare services.

5. **Health & Family Welfare Services:**

Access to healthcare services and the quality of health systems are crucial determinants. Availability of preventive care, medical treatments, and public health interventions impact overall health outcomes.

Responsibility for health

1. Individual Responsibility:

Description: Individual responsibility in health refers to the actions and choices that an individual makes to maintain and promote their own well-being. This includes adopting healthy lifestyle practices, making informed choices about diet and physical activity, avoiding harmful behaviors like smoking or excessive alcohol consumption, and actively seeking medical care when needed.

Example: An individual takes responsibility for their health by engaging in regular physical exercise, maintaining a balanced diet rich in nutrients, managing stress through relaxation techniques, and getting regular check-ups to detect and address health issues early.

2. Community Responsibility:

Description: Community responsibility involves collective actions taken by a group or community to create an environment that supports the health and well-being of its members. This can include community-wide initiatives such as providing accessible healthcare services, promoting health education programs, ensuring clean and safe living conditions, and fostering a sense of social connectedness to address mental health.

Example: A community initiates a health awareness campaign, providing resources and education on topics such as nutrition, mental health, and preventive measures. Community members actively participate in local health initiatives, creating a supportive environment for healthier lifestyle choices.

3. State Responsibility:

Description: State responsibility refers to the role of governmental bodies in ensuring the health and welfare of the population. This involves the formulation and implementation of health policies, the provision of healthcare infrastructure and services, regulation of healthcare practices, disease prevention and control measures, and addressing health disparities. The state is responsible for creating an environment that enables individuals and communities to attain the highest possible level of health.

Example: The government implements a national vaccination program to protect the population from preventable diseases. It establishes and enforces regulations to ensure the safety of food and water, invests in healthcare infrastructure, and addresses health disparities by providing access to quality healthcare services for all citizens.

4. International Responsibility:

Description: International responsibility involves collaboration and coordination among countries and global entities to address health challenges that extend beyond national borders. This includes responding to global health crises, sharing resources and expertise, supporting research and development for infectious diseases, and promoting international agreements and conventions that contribute to improving health on a global scale.

Example: During a global health crisis, multiple countries collaborate to share information, resources, and expertise. International organizations like the World Health Organization (WHO) coordinate efforts to control the spread of diseases, distribute vaccines, and provide assistance to regions facing health emergencies.

Lifestyle:

Lifestyle refers to the way in which individuals or groups of people live, including their behaviors, habits, values, attitudes, and choices. It encompasses the day-to-day activities, routines, and decisions that individuals make, reflecting their preferences, beliefs, and overall approach to life.

A lifestyle which includes activities and habits that encourage the development of total physical, mental, and spiritual fitness, and which reduces the risk of major illness. Healthy activities and habits include regular exercise; a balanced, nutritious diet; adequate sleep and relaxation; abstaining from smoking and taking nonessential drugs; and moderating the intake of alcohol.

In recent decades, life style as an important factor of health is more interested by researchers. According to WHO, 60% of related factors to individual health and quality of life are correlated to lifestyle.

Nutrition:

- **Foods:** products derived from plants or animals that can be taken into the body to give in energy for the maintenance of life & the growth & repair of tissues.
- **Nutrient:** organic and inorganic compounds contained in food (Ex: proteins, vitamins, minerals, etc.).
- **Diet:** the foods & beverages a person eat & drink.
- **Nutrition**: the science of foods & the nutrients & other substances they contain, & of their actions within the body (including ingestion, digestion, absorption, transport, metabolism, & excretion).
- **Dietetics:** the practical applications of the principles of nutrition; it includes the planning of meals for the well & the sick.

Why we study Nutrition & Health?

1. **Prevention of Nutrient Deficiency and Achieving RDA:**

Historically, the primary focus of human nutrition was to prevent nutrient deficiencies and achieve Recommended Dietary Allowances (RDA). This approach aimed at ensuring individuals receive adequate amounts of essential nutrients to maintain health. Example: Studying nutrition helps identify specific nutrient requirements to prevent conditions like scurvy (vitamin C deficiency) or rickets (vitamin D deficiency) and ensures individuals meet recommended intakes for overall well-being.

2. **Centuries of Recognizing Food's Importance for Health and Disease:**

Throughout history, food has been recognized as a crucial factor in human health and disease. The understanding that dietary habits directly impact well-being has been present for centuries. Example: Ancient civilizations recognized the connection between a balanced diet and physical health, leading to cultural practices emphasizing the importance of diverse, nutrient-rich foods.

3. **Association of Nutrition with Various Health Aspects:**

Nutrition is associated with a range of health aspects, including infection, immunity, fertility, maternal and child health, and overall family health. Example: Adequate maternal nutrition during pregnancy is linked to healthy fetal development, highlighting the importance of proper nutrition for both maternal and child health.

4. **Role of Dietary Factors in Non-Communicable Diseases (NCDs):**

Recent interest focuses on understanding the role of dietary factors in the development of Non-Communicable Diseases (NCDs) such as coronary heart disease (CHD), Diabetes Mellitus (DM), and cancer. Example: Research explores how dietary choices, like a high-sugar or high-fat diet, contribute to the development of chronic conditions, emphasizing the need for dietary interventions for disease prevention.

5. **Multifactorial Nature of Nutritional Problems:**

Nutritional problems are multifactorial, influenced by various factors such as education, demography, agriculture, and rural development. Example: Lack of nutritional education, coupled with agricultural practices that limit food diversity, can contribute to nutritional deficiencies in rural communities, showcasing the interconnected nature of nutrition-related challenges.

6. **Epidemiologic Evidence on Major Causes of Death:**

Epidemiologic evidence indicates that CHD and cancer have become major causes of death in Western countries, prompting a deeper examination of lifestyle and dietary factors. Example: Studies show a correlation between Western dietary patterns (high in processed foods and saturated fats) and an increased incidence of CHD, leading to a focus on dietary modifications for prevention.

Overall Implication:

The study of nutrition and health encompasses a historical perspective, recognizes the intricate connections between diet and various health aspects, and addresses contemporary challenges related to NCDs and multifactorial nutritional problems. This knowledge informs strategies for promoting optimal health and preventing diseases.

End of module 1…