

UNIT-1

PART-1

Dietary supplements and nutraceuticals

Points to be covered in this topic

→ **Functional foods**

→ **Nutraceuticals and
Dietary supplements**

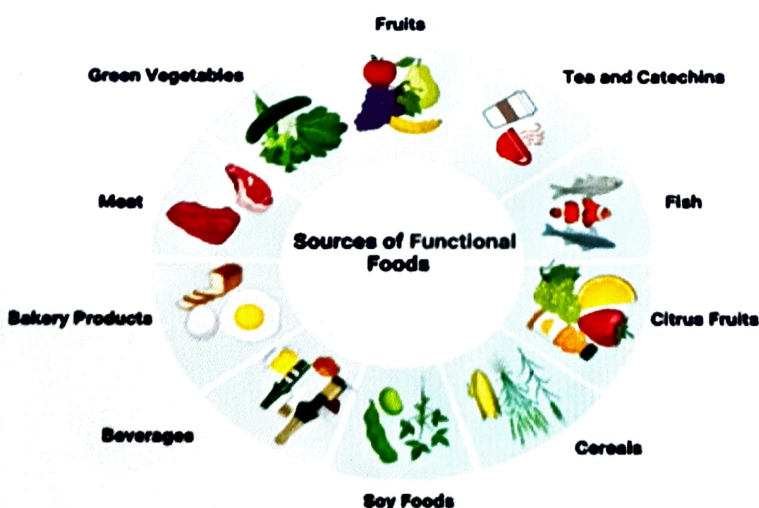
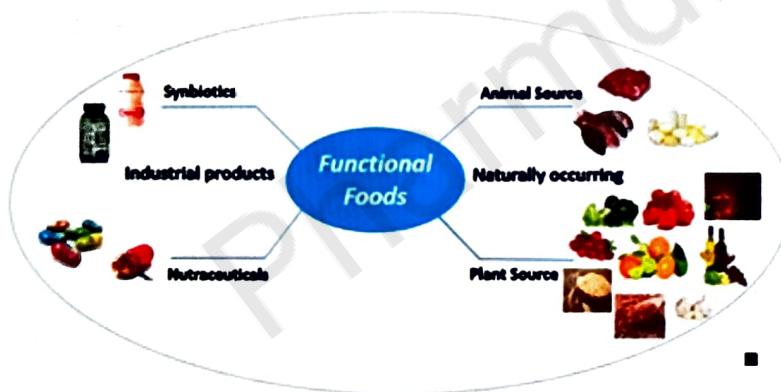
→ **Classification of Nutraceuticals**

→ **Health problems and diseases**

❑ Functional foods



- Functional food can be defined as any food that exerts **health properties beyond the traditional nutrients it contains**. If the functional food helps in the prevention of a disease or its treatment it can be called 'nutraceutical'.
- Generally, functional food can give its user some specified or predetermined amount of effective nutrients like **vitamins, fats, proteins, carbohydrates, fibres etc**, needed for our **growth, development and maintenance of health**.
- Functional foods are one of the **fastest-growing segments of the food industry**.
- In some countries, functional foods have already become part of the dietary landscape.



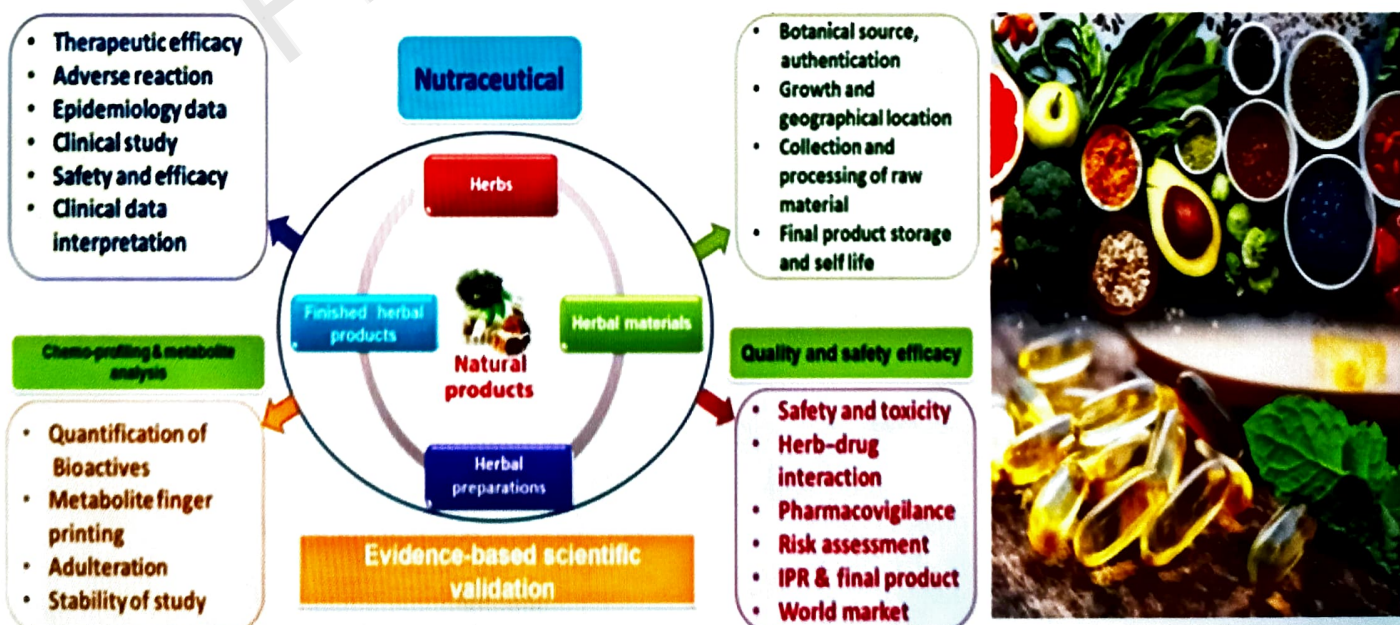
- Functional foods, according to generally accepted definition, foods including whole foods and fortified, enriched, or enhanced **foods or dietary components** that may **reduce the risk of chronic disease and provide a health and physiological benefit beyond the traditional nutrients it contains**.

❑ Nutraceuticals and Dietary supplements



➤ Nutraceuticals:

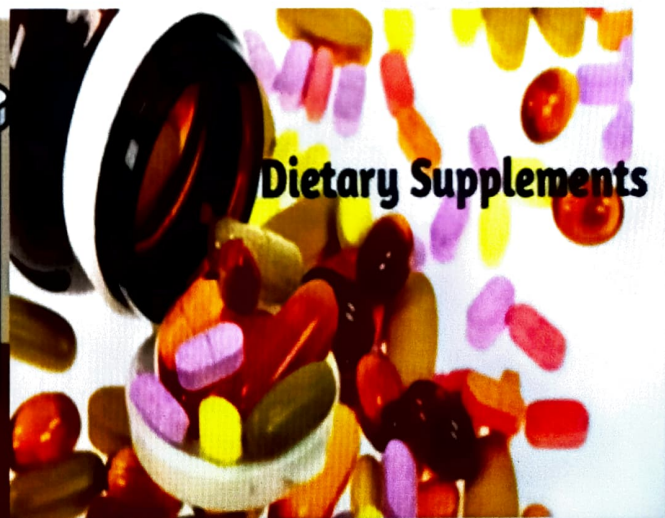
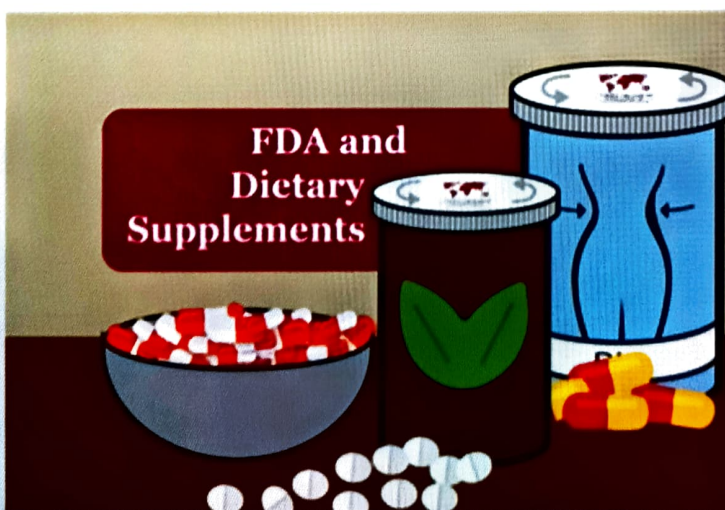
- The term 'nutraceutical product' was coined by the **Foundation for Innovation in Medicine (FIM)** in 1991.
- FIM defined a nutraceutical product as '**any substance that may be considered a food or part of a food that provides medical or health benefits including the prevention and treatment of disease**'.
- Nutraceutical products may range from **isolated nutrients, dietary supplements and specific diets** to genetically engineered **designer foods, herbal products and processed foods** such as cereals, soups and beverages.
- The ingredients of nutraceuticals include **trace elements, minerals, vitamins, proteins, carbohydrates, amino acids** etc. Many diseases are believed to have a close relation with nutrients and food supplements. Proteins are essential in building body and making it fit. Basically **protein and protein supplements** are required in building muscles.



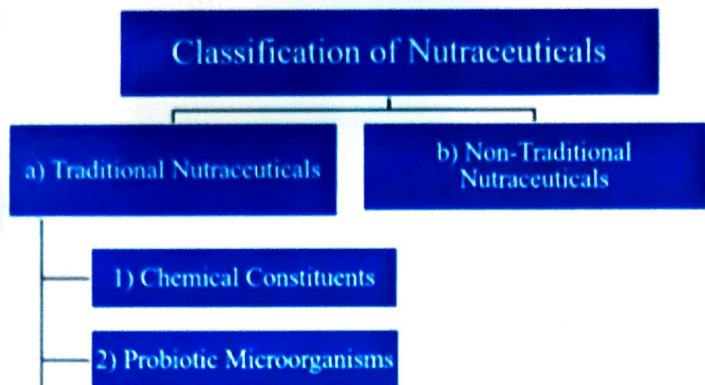
➤ Dietary supplements



- A food supplement, also known as **dietary supplement or nutritional supplement**, is a preparation intended to provide nutrients that are **missing or are not consumed in sufficient quantity in a person's diet**.
- In different countries, dietary supplements are classified differently.
- In some countries, they are categorized under foods whilst in some as drugs.
- Dietary supplements also include **non-medicinal herbal supplements and hormones like pregnenolone and melatonin**.
- Generally, a dietary supplement contains ingredients like **vitamins, minerals, amino acids, herbs, concentrate, metabolite, extract, or combinations**. Dietary supplements are also used to **increase the performance of athletes and sports players**.
- Food supplements are the best way to get our daily dose of vitamins and minerals especially in children.
- **Vegetarian diet often lacks vitamin B12, hence Vitamin B12 supplement is useful for the vegetarians.**



❑ Classification of Nutraceuticals



➤ Traditional nutraceuticals

Traditional nutraceuticals are simply natural with no changes to the food. **Food contains several natural components that deliver benefits beyond basic nutrition**, such as **lycopene in tomatoes, omega-3 fatty acids in salmon or saponins in soy**.

They are grouped on the basis of

I. Chemical Constituents

a) Nutrients: Substances such as **vitamins, minerals, amino acids and fatty acids** with established nutritional functions. Most vegetables, **wholegrain cereals, dairy products, fruits and animal products such as meat, and poultry, contain vitamins** and are helpful in **curing heart diseases, stroke, cataracts**

b) Herbals: Nutraceuticals holds a great promise to improve health and **prevent chronic diseases** with the help of herbals. Some examples are **willow bark (Salix nigra), having active component as salicin,** which

is **anti-inflammatory, analgesic, antipyretic, astringent and antiarthritic**

c) Phytochemicals: They are **classified on the basis of chemical name given according** to their phytochemical properties.

II. Probiotic Microorganisms

The scientific interest in probiotics boosted from the work of Metchinkoff to transform the toxic flora of the large intestine into a host-friendly colony of *Bacillus bulgaricus* was found by Hord. 'Probiotics' mean '**for life**' and are defined as live microorganisms, which when consumed in adequate amounts, confer a **health effect** on the host. They are friendly bacteria that promote healthy digestion and absorption of some nutrients. They act to crowd out pathogens, such as yeasts, other bacteria and viruses that may otherwise **cause disease** and develop a mutually advantageous symbiosis with the human gastrointestinal tract. They have an antimicrobial **effect through modifying the microflora, preventing adhesion of pathogens to the intestinal epithelium, competing for nutrients necessary for pathogen survival, producing an antitoxin effect and reversing some of the consequences of infection on the intestinal epithelium, such as secretory changes and neutrophil migration.**

➤ Non-traditional nutraceuticals

Non-traditional nutraceuticals are artificial foods prepared with the help of **biotechnology**. Food samples contain **bioactive components** which are engineered to produce products for human- wellness. They are arranged into

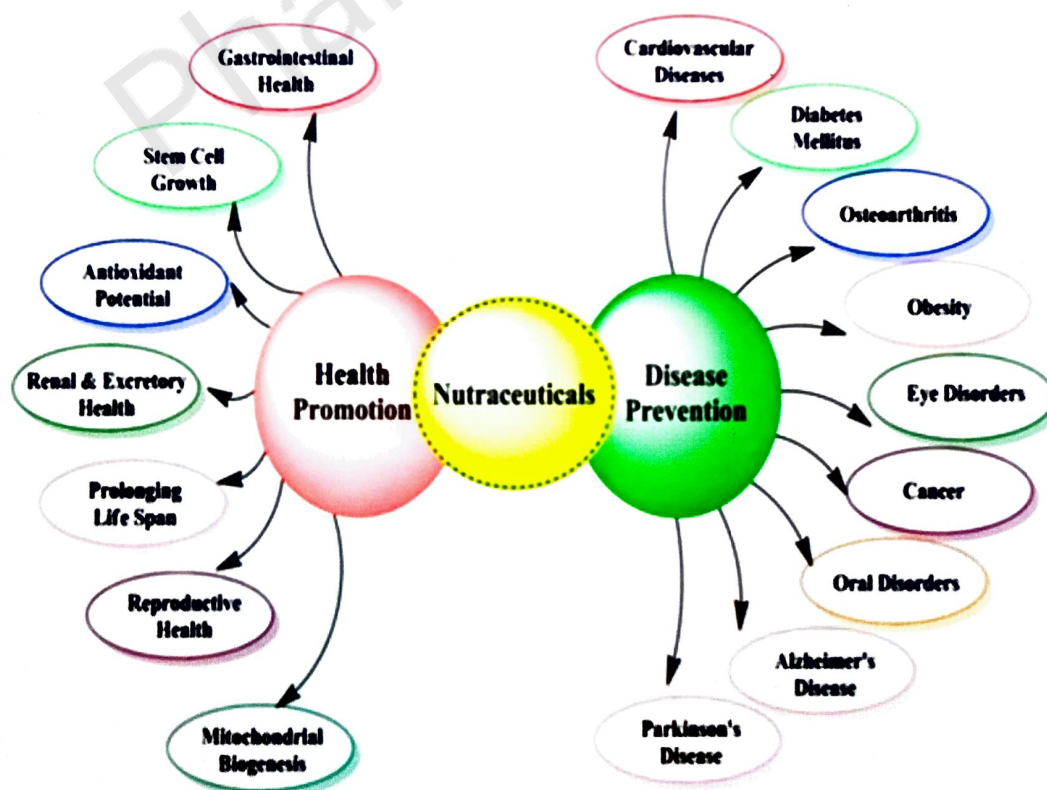
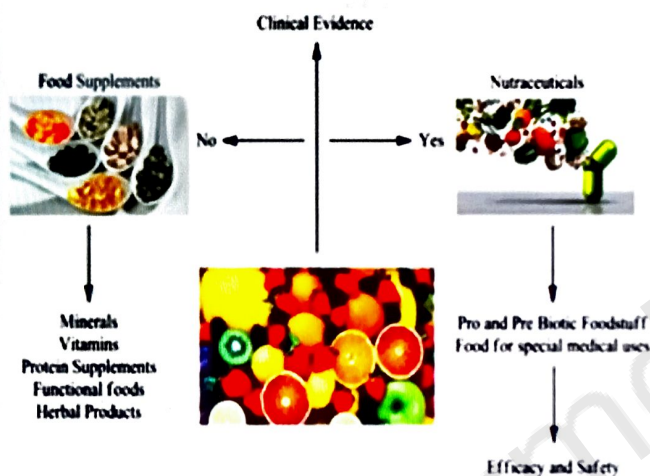
a) Fortified nutraceuticals

It constitutes fortified food from agricultural breeding or added nutrients and/or ingredients. **e.g. orange juice fortified with calcium, cereals with added vitamins or minerals and flour with added folic acid.** Some **examples are milk fortified with cholecalciferol used in vitamin D deficiency.**

b) Recombinant nutraceuticals

Energy-providing foods, such as **bread, alcohol, fermented starch, yogurt, cheese, vinegar, and others** are produced with the help of biotechnology. The production of probiotics and the extraction of bioactive components by enzyme/fermentation technologies as well as **genetic engineering technology** are achieved through biotechnology.

❑ Health problems and diseases



➤ **weight control**

- There is a very high prevalence of obesity globally; hence **nutrition and exercise play key roles in its prevention and treatment**.
- Nutraceuticals like **conjugated linoleic acid (CLA), capsaicin, Momordica Charantia (MC), and Psyllium fibre** possess potential **anti-obesity properties**.
- A blend of **glucomannan, chitosan, fenugreek, G Sylvester, and vitamin C** in the dietary supplement significantly reduced body weight and promoted fat loss in obese individuals.

➤ **Diabetes**

- Diabetes mellitus is characterized by abnormally **high levels of blood glucose, either due to insufficient insulin production** or due to its **ineffectiveness**.
- The most common forms of diabetes are type-1 diabetes (5%), an autoimmune disorder, and type-2 diabetes (95%), which is associated with obesity

✓ **Docosahexaenoic acid**

- Docosahexaenoic acid modulates insulin resistance and is also vital for neuro visual development.
- This is especially **important in women with gestational diabetes mellitus** which foster the recommendation for essential fatty acids during pregnancy.

✓ **Lipoic acid**

- Lipoic acid is a **universal antioxidant**, now used in Germany for the **treatment of diabetic neuropathy**. It is possible that lipoic acid may be more effective as a long-term **dietary supplement** aimed at the prophylactic protection of diabetics from complications.

✓ **Dietary fibres**

- Dietary fibres from psyllium have been used extensively both as pharmacological supplements, food ingredients, in processed food to aid weight reduction, for glucose control in diabetic patients and to reduce lipid levels in hyperlipidemia.

✓ **Magnesium**

- Good magnesium status reduces diabetes risk and improves insulin sensitivity; chromium picolinate, calcium and vitamin D appear to promote insulin sensitivity and improve glycemic control in some diabetics; extracts of bitter melon and of cinnamon have the potential to treat and possibly prevent diabetes.

➤ **Cancer**

✓ **Prostate cancer**

Mode of Action

Antiproliferation, cell cycle inhibition, angiogenesis inhibition and promotion of apoptosis

Nutraceutical: **Vitamin D**

Mode of Action

Antioxidation, antiproliferation, and promotion of apoptosis

Nutraceutical: **Catechins in green tea**

✓ **Breast cancer**

Mode of Action

Antiproliferation and promotion of apoptosis

Nutraceutical: **Curcumin**

Mode of Action

Cell cycle inhibition, promotion of apoptosis, and inhibition of metastasis

Nutraceutical: **Vitamin D**

✓ **Oral cancer**

Mode of Action

Prevent tumor initiation

Nutraceutical: Strawberry

Mode of Action

Antiproliferation, promotion of apoptosis, and angiogenesis inhibition

Nutraceutical: Geraniol

✓ **Colon cancer**

Mode of Action

Tumor marker suppression, promotion of apoptosis, metastasis inhibition, and antiproliferation

Nutraceutical: Polyphenols

Mode of Action

Antioxidant, antiproliferation, promotion of apoptosis, inflammatory protein inhibition

Nutraceutical: Terpenoids

➤ **Heart disease**

- Worldwide, the burdens of chronic diseases like **cardiovascular diseases, cancers, diabetes and obesity is rapidly increasing**. Chronic diseases contributed approximately 59% of the 56.5 million total reported deaths in the world and 46% of the global burden of disease.
- Cardiovascular disease (CVD) is the name for the group of disorders of the **heart and blood vessels and includes hypertension (high blood pressure), coronary heart disease (heart attack), cerebrovascular disease (stroke), heart failure, peripheral vascular disease, etc**

This apart, nutraceuticals in the form of **antioxidants, dietary fibres, omega-3 polyunsaturated fatty acids (n-3 PUFAs), vitamins, and**

minerals are recommended together with physical exercise for the prevention and treatment of CVD.

- It has been demonstrated that the molecules like polyphenols present in **grapes and in wine alter cellular metabolism and signalling, which is consistent with reducing arterial disease.**

✓ **Flavonoids**

- Flavonoids are widely distributed in **onion, endives, cruciferous vegetables, black grapes, red wine, grapefruits, apples, cherries and berries.**
- Flavonoids in plants are available as **flavones (containing the flavonoid apigenin found in chamomile); flavanones (hesperidins -citrus fruits; silybin- milk thistle flavonols (tea: quercetin, kaempferol and rutin grapefruit; rutin buckwheat; ginkgo flavon glycosides - ginkgo)** play a major role in curing the cardiovascular diseases.
- Flavonoids **block the angiotensin-converting enzyme (ACE) that raises blood pressure; by blocking the “suicide” enzyme cyclooxygenase that breaks down prostaglandins, prevents platelet stickiness and hence platelet aggregation.**

➤ **stress**

Nutraceutical options for addressing some of the most common issues associated with stress

✓ **B-Complex Vitamins**

- The B-complex vitamins are intimately involved in the function of the nervous system, and so can play a role in **helping to counter some of the negative effects of stress.**

✓ **Phosphatidylserine**

- Research has demonstrated that phosphatidylserine (PS) was able to blunt the release of cortisol—the “**stress hormone**”—in response to exercise stress. In some cases, PS supplementation also resulted in improved mood.

✓ **L-Theanine**

- The amino acid L-theanine has been shown to **increase both serotonin and dopamine production**, and possibly gamma amino butyric acid (GABA) as well.
- Evidence from human electroencephalograph (EEG) studies show that it also significantly **increases brain activity in the alpha frequency band**, which indicates that it **relaxes the mind without inducing drowsiness**. Other research indicates that L-theanine has a significant effect on **improving mental alertness while promoting relaxation**.

✓ **Rhodiola Rosea Root Extract**

- Rhodiola rosea root, another adaptogen, has been used for centuries in the traditional systems of healthcare throughout Russia, Scandinavia, and other countries where it was used to **increase physical endurance, work productivity, and longevity, as well as to treat fatigue, mood, and promote a healthy nervous system**.

✓ **Panax Ginseng**

- Panax ginseng root, or ginseng for short, is a traditional Chinese herb which has been used for thousands of years in various aspects of healthcare.
- It is also one of the most widely researched herbs in modern science with over 5,000 published studies.
- Ginseng helps stabilize physiological processes and promote **homeostasis, especially in the case of stress and fatigue**.

➤ **Osteoarthritis nutraceuticals**

- Osteoarthritis (OA), a debilitating joint disorder, is the most common form of arthritis.
- Joint discomfort from OA and other joint disorders may **reduce physical activity** in individuals experiencing this condition, resulting in **energy imbalance and weight gain**. **Increased weight can exacerbate existing problems, through additional stress on joints.**

✓ **Glucosamine (GLN) and chondroitin sulfate (CS)**

- **Glucosamine (GLN) and chondroitin sulfate (CS) is widely used to alleviate symptoms of OA.**
- These nutraceuticals have both **nutrient and pharmaceutical properties** and seem to **regulate gene expression and synthesis of NO and PGE2, providing a plausible explanation for their anti-inflammatory activities**

UNIT-1

PART-2

Dietary supplements and nutraceuticals

Points to be covered in this topic

→ **Public health nutrition**

→ **Maternal and child nutrition**

→ **Nutrition and Ageing**

→ **Nutrition education in community**

→ **Source, Name and their chemical nature, Medicinal uses and health benefits of following used as nutraceuticals/ functional foods**

❑ Public health nutrition



- Public health nutrition is the **science and art of preventing disease, prolonging life, and promoting health through the medium of nutrition.**
- It involves the application of nutrition principles to **create, implement, and evaluate policies, programs, and interventions** that aim to **improve the health and well-being of populations.** The field of public health nutrition encompasses a broad range of activities, including:

1.Nutritional assessment: The **process of collecting and analyzing information** about the nutritional status of populations or individuals to identify nutrition-related problems and develop appropriate interventions.

2.Epidemiology: The study of the distribution and determinants of health and disease in populations. Epidemiological **studies are used to identify the risk factors for nutrition-related diseases and to design interventions to prevent or treat** these conditions.

3.Policy development: The **process of creating policies and guidelines related to nutrition and health at the local, state, and national levels.** Public health nutrition professionals play a key role in advocating for policies that support healthy eating and active living.

4.Program planning and implementation: The **development and delivery of nutrition education and other interventions designed to improve the nutritional status of individuals and populations.** These programs can range from school-based nutrition education programs to community-based nutrition initiatives.

5.Monitoring and evaluation: The **process of assessing the effectiveness of nutrition interventions and programs to determine whether they are achieving their intended outcomes.**

❑ Maternal and child nutrition

- Maternal and child nutrition is the **study of the nutritional needs and requirements of pregnant and breastfeeding women, as well as infants, young children, and adolescents**. Good nutrition is critical during the early stages of life, as it supports **healthy growth and development and can have lifelong impacts on health outcomes**.
- Maternal nutrition is **essential for fetal growth and development**. Pregnant women need increased amounts of certain nutrients, such as **folic acid, iron, and calcium**, to support the growth and development of their baby. Poor maternal nutrition can increase the risk of complications during pregnancy, such as preterm birth and low birth weight.
- Infants and young children also have specific nutritional requirements, as they are growing and developing rapidly. Breastfeeding is recommended as the best form of nutrition for infants up to six months of age, as breast milk provides all the nutrients they need for healthy growth and development. After six months, complementary foods can be introduced to supplement breast milk, and it's important to ensure that these foods are nutritious and appropriate for the child's developmental stage.
- Ensuring good maternal and child nutrition requires access to a variety of nutritious foods and education on healthy eating habits. It's also **important to address social, economic, and environmental factors** that may impact access to **healthy food options, such as poverty and food insecurity**. Adequate nutrition during the early stages of life can have long-term impacts on health and wellbeing, highlighting the importance of addressing maternal and child nutrition as a critical public health issue.

Maternal and
Pediatric Nutrition



➤ **Example of Maternal nutrition**

Maternal nutrition refers to the nutritional needs and requirements of pregnant women, which can have a significant impact on the health and development of their growing fetus. Here are some examples of maternal nutrition:

1.Adequate calorie intake: Pregnant women need to consume enough calories to support the **growth and development of their fetus**. However, the exact number of calories needed can vary depending on factors such as **age, weight, and activity level**.

2.Protein: Protein is essential for **fetal growth and development**. Pregnant women need to consume adequate amounts of protein to support the **growth of the placenta and the development of the fetus**.

3.Iron: Iron is important for the **production of red blood cells**, which **carry oxygen to the fetus**. Pregnant women need to consume more iron than non-pregnant women to support fetal growth and development.

4.Folic acid: Folic acid is important for the **development of the fetal neural tube**. Pregnant women need to consume enough folic acid to prevent neural tube defects in their baby.

5.Calcium: Calcium is essential for the **development of the baby's bones and teeth**. Pregnant women need to consume enough calcium to support the growth and development of their baby.

6.Vitamins and minerals: Pregnant women also need to consume a variety of vitamins and minerals to **support the growth and development of their baby, including vitamin D, vitamin C, and omega-3 fatty acids**.

➤ **Example of Infants and young children nutrition**

Infants and young children have specific nutritional needs that are essential for their growth and development. Here are some examples of infants and young children nutrition:

1. Breastfeeding: Breast milk is the best source of nutrition for infants **up to six months of age**. It provides all the nutrients they need for **healthy growth and development**, including **protein, carbohydrates, and fat**.

2. Complementary foods: After six months of age, complementary foods can be introduced to **supplement breast milk**. These foods should be nutrient-dense and appropriate for the child's developmental stage.

3. Iron-rich foods: Infants and young children need adequate amounts of iron for their **growth and development**. Iron-rich **foods, such as meat, poultry, fish, and fortified cereals, can be introduced as complementary foods**.

4. Fruits and vegetables: Fruits and vegetables are important **sources of vitamins, minerals, and fiber**. They should be introduced early on as complementary foods to help establish healthy eating habits.

5. Healthy fats: Healthy fats, such as those found in **avocado, nut butters, and fatty fish**, are important for brain development and should be included in the child's diet.

Nutrition and Ageing

Nutrition plays an important role in healthy aging. As people age, their bodies undergo changes that can affect their nutritional needs and requirements.

Good nutrition can help support healthy aging and prevent or manage chronic conditions that become more common with age. Here are some ways in which nutrition and aging are interconnected:

1. Nutrient absorption: As people age, their bodies may become less efficient at absorbing nutrients. This can lead to deficiencies in essential **vitamins and minerals, such as vitamin B12 and calcium, and can increase the risk of chronic conditions such as osteoporosis and anemia**.



2. Muscle mass: Age-related **muscle loss, or sarcopenia**, is a common problem that can lead to **reduced mobility and increased risk of falls**. Adequate protein intake and resistance exercise can help maintain muscle mass and function in older adults.

3. Chronic conditions: Chronic conditions such as **heart disease, diabetes, and osteoporosis** become more common with age. Good nutrition can help prevent or manage these conditions, and may even help reduce the need for medication.

4. Hydration: Dehydration is a common problem in older adults, and can lead to a variety of health problems such as **constipation, urinary tract infections, and confusion**. Older adults should drink plenty of fluids, particularly water, to stay hydrated.

5. Caloric needs: As people **age, their caloric needs may decrease due to changes in metabolism and reduced physical activity**. However, nutrient needs remain the same, so it's important for older adults to choose nutrient-dense foods to meet their nutritional needs without consuming excess calories.

6. Social and economic factors: Social isolation and poverty can impact the nutrition status of older adults, as they may have limited access to healthy food options or may struggle to afford healthy food choices.

❑ Nutrition education in community

Nutrition education in the community involves providing information and resources to help people make informed and healthy food choices. This type of education can be delivered in various ways, such as **workshops, cooking demonstrations, public health campaigns, and educational materials**. Here are some key elements of effective nutrition education in the community:

1. Target audience: Nutrition education should be tailored to the specific needs and interests of the community. This could include people with certain **health conditions, children, families, or specific cultural or ethnic groups**.

2. Interactive and hands-on: Interactive and hands-on learning experiences, such as cooking demonstrations and taste tests, can be more engaging and effective than lectures or presentations.

3. Culturally sensitive: It's important to take into account cultural factors that may influence food choices and eating habits. Nutrition education materials and activities should be culturally sensitive and appropriate.

4. Collaborative: Effective nutrition education often involves collaboration between community organizations, public health agencies, and other stakeholders. Collaboration can help ensure that resources are used efficiently and that education programs reach a wider audience.

5. Inclusive: Nutrition education should be inclusive of all members of the community, regardless of age, gender, or socioeconomic status. It's important to ensure that everyone has access to nutrition education resources and activities.

6. Sustainable: To be effective, nutrition education should be sustainable over time. This could involve developing partnerships with local businesses or organizations to provide ongoing support, or incorporating nutrition education into existing programs or curriculum.

7. Evidence-based: Nutrition education should be based on the latest scientific evidence and guidelines. This can help ensure that the information provided is accurate and up-to-date.

❑ Source, Name and their chemical nature, Medicinal uses and health benefits of following used as nutraceuticals/ functional foods

- ❖ **Spirulina**
- ❖ **Soyabean**
- ❖ **Ginseng**
- ❖ **Garlic**
- ❖ **Broccoli**
- ❖ **Gingko**
- ❖ **Flaxseeds**

❖ **Spirulina**

✓ **Source-** Spirulina is found in soil, marshes, freshwater, brackish water, seawater, and thermal springs.

✓ **Chemical name-** Arthrospira platensis

✓ **Chemical contains-** fatty acids such as linoleic acid, docosahexaenoic acid, eicosapentaenoic acid, arachidonic acid, and stearidonic acid, respectively.

✓ **Medicinal uses and health benefits -**

1. Spirulina Is Extremely High in Many Nutrients
2. Powerful Antioxidant and Anti-Inflammatory Properties
3. Can Lower “Bad” LDL and Triglyceride Levels
4. Protects “Bad” LDL Cholesterol From Oxidation
5. May Have Anti-Cancer Properties
6. May Reduce Blood Pressure
7. Improves Symptoms of Allergic Rhinitis
8. May Be Effective Against Anemia



❖ Soyabean



- ✓ **Source-** Soybeans are the seeds of the soybean plant, scientifically known as *Glycine max*. They are a major source of protein, fiber, healthy fats, vitamins, and minerals.
- ✓ **Chemical name-** *Glycine max*
- ✓ **Chemical nature-** Soybeans contain several biologically active compounds, including isoflavones, saponins, phytosterols, and phytic acid. The major isoflavones found in soybeans are genistein, daidzein, and glycitein, which are phytoestrogens that mimic the effects of estrogen in the body.
- ✓ **Medicinal uses and health benefits -**
 1. **Heart Health:** Soybeans are rich in polyunsaturated fats, fiber, and plant sterols, which can help lower LDL (bad) cholesterol levels and reduce the risk of heart disease.
 2. **Bone Health:** The isoflavones in soybeans have been shown to improve bone density and reduce the risk of osteoporosis, particularly in postmenopausal women.
 3. **Cancer Prevention:** Soybeans and their isoflavones have been associated with a reduced risk of breast cancer, prostate cancer, and other hormone-related cancers.
 4. **Diabetes Management:** Soybeans have a low glycemic index, which means they have a minimal effect on blood sugar levels. This makes them a good food choice for people with diabetes.
 5. **Menopausal Symptoms:** The phytoestrogens in soybeans have been shown to reduce hot flashes and other symptoms associated with menopause.

❖ Ginseng

✓ **Source-** Ginseng refers to a group of plants in the genus *Panax*, including *Panax ginseng* (Asian or Korean ginseng) and *Panax quinquefolius* (American ginseng). These plants are native to Asia and North America

✓ **Chemical name-** Ginsenoside

✓ **Chemical nature-** Ginseng contains several biologically active compounds, including ginsenosides, polysaccharides, peptides, and flavonoids. The ginsenosides are considered the primary active compounds in ginseng and are classified as triterpene saponins. There are several types of ginsenosides, including Rb1, Rg1, Rg3, and Re, which are believed to be responsible for many of ginseng's health benefits.

✓ **Medicinal uses and health benefits -**

1. **Boosts Energy and Reduces Fatigue:** Ginseng has been used traditionally to increase energy and reduce fatigue. Several studies have found that ginseng can help improve physical and mental performance, particularly in people who are under stress.
2. **Enhances Cognitive Function:** Ginseng has been shown to improve memory, concentration, and other cognitive functions in both healthy individuals and those with cognitive impairment.
3. **Reduces Stress and Anxiety:** Ginseng has been shown to have an adaptogenic effect, meaning it can help the body adapt to stress and reduce feelings of anxiety.
4. **Enhances Immune System:** Some studies suggest that ginseng may enhance the immune system and reduce the risk of infections.
5. **Reduces Inflammation:** Ginseng has anti-inflammatory properties and has been shown to reduce inflammation in the body, which may be beneficial for several health conditions, including arthritis and heart disease.



❖ Garlic

- ✓ **Source-** Garlic (*Allium sativum*) is a species in the onion family Alliaceae, widely cultivated for its pungent bulbs. It is a perennial plant that grows up to 2 feet tall and has long, flat leaves that can reach up to 1 foot in length.



- ✓ **Chemical name-** *Allium sativum* L.
- ✓ **Chemical nature-** Garlic contains several important compounds, including allicin, alliin, ajoene, and diallyl disulfide. Allicin is a sulfur-containing compound that gives garlic its characteristic odor and taste. It is a highly reactive and unstable compound that is quickly broken down into other sulfur-containing compounds, such as ajoene and diallyl disulfide, which are more stable.
- ✓ **Medicinal uses and health benefits -**
 1. **Boosts immune system:** Garlic has immune-boosting properties and has been shown to stimulate the production of white blood cells, which help fight infections and diseases.
 2. **Lowers blood pressure:** Garlic has been shown to have a mild blood pressure-lowering effect, which may help reduce the risk of heart disease.
 3. **Lowers cholesterol levels:** Garlic has been shown to reduce total and LDL cholesterol levels in people with high cholesterol.
 4. **Prevents blood clotting:** Garlic has antiplatelet activity, which means it can help prevent blood clots from forming and reduce the risk of heart attack and stroke.
 5. **Reduces inflammation:** Garlic has anti-inflammatory properties and has been shown to reduce inflammation in the body, which is believed to be a contributing factor to many chronic diseases.

❖ Broccoli

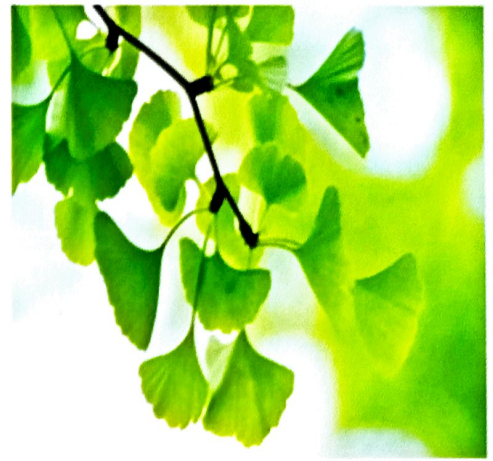
- ✓ **Source-** Broccoli (*Brassica oleracea* var. *italica*) is a cruciferous vegetable that belongs to the same family as cabbage, kale, and cauliflower. It is native to the Mediterranean region and has been cultivated for over 2,000 years.



- ✓ **Chemical nature-** Broccoli contains several important compounds, including sulforaphane, indole-3-carbinol, and glucoraphanin. Sulforaphane is a sulfur-containing compound that is formed when the vegetable is chopped or chewed. It is a potent antioxidant and has been shown to have anti-cancer properties. Indole-3-carbinol is a compound that is formed when the vegetable is cooked. It is believed to have anti-estrogenic effects and may help reduce the risk of breast cancer. Glucoraphanin is a compound that is converted to sulforaphane in the body.
- ✓ **Medicinal uses and health benefits -**
 1. **Anticancer properties:** Broccoli is rich in sulforaphane, which has been shown to have anti-cancer properties. It may help reduce the risk of certain types of cancer, such as lung, prostate, and colon cancer.
 2. **Anti-inflammatory properties:** Broccoli contains compounds that have anti-inflammatory properties and may help reduce inflammation in the body.
 3. **Cardiovascular health:** Broccoli is a good source of fiber and antioxidants, which can help reduce the risk of heart disease. It also contains compounds that may help lower cholesterol levels.
 4. **Eye health:** Broccoli is rich in lutein and zeaxanthin, two important antioxidants that are believed to help protect the eyes from damage.
 5. **Digestive health:** Broccoli is a good source of fiber and can help promote digestive health by keeping the digestive system functioning properly.

❖ Ginkgo

✓ **Source-** Ginkgo (*Ginkgo biloba*) is a unique species of tree that is native to China and has been cultivated for over 1,000 years. It is now widely grown and used around the world.



✓ **Chemical name-** *Ginkgo biloba* L.

✓ **Chemical nature-** Ginkgo contains several important compounds, including flavonoids, terpenoids, and bilobalides. Flavonoids are powerful antioxidants that protect the body from free radical damage. Terpenoids are compounds that have anti-inflammatory properties and may help improve circulation. Bilobalides are unique compounds that are only found in ginkgo and are believed to have neuroprotective effects.

✓ **Medicinal uses and health benefits -**

1. **Cognitive function:** Ginkgo is believed to have cognitive-enhancing properties and may help improve memory, attention, and concentration. It is often used to treat age-related cognitive decline and dementia.
2. **Anti-inflammatory properties:** Ginkgo contains compounds that have anti-inflammatory properties and may help reduce inflammation in the body. It is often used to treat conditions that are caused by inflammation, such as asthma and arthritis.
3. **Improves circulation:** Ginkgo has been shown to improve circulation by dilating blood vessels and reducing the stickiness of platelets. It is often used to treat conditions that are caused by poor circulation, such as Raynaud's disease and tinnitus.
4. **Eye health:** Ginkgo is believed to help improve vision and protect the eyes from damage. It is often used to treat conditions that affect the eyes, such as macular degeneration and glaucoma.
5. **Anxiety and depression:** Ginkgo has been shown to have anxiolytic and antidepressant effects and may help reduce symptoms of anxiety and depression.

❖ Flaxseeds

✓ **Source-** Flaxseeds (*Linum usitatissimum*) are a tiny, brown or golden-colored seed that comes from the flax plant, which is native to the Middle East and has been cultivated for thousands of years. Today, flaxseeds are widely available in supermarkets and health food stores.



✓ **Chemical name-** *Linum usitatissimum* L

✓ **Chemical nature-** Flaxseeds are rich in several important compounds, including omega-3 fatty acids, lignans, and fiber. Omega-3 fatty acids are essential fatty acids that the body needs for proper functioning. Lignans are a type of phytoestrogen, which means they have weak estrogen-like effects in the body. Fiber is a type of carbohydrate that the body can't digest, but it is important for digestive health.

✓ **Medicinal uses and health benefits -**

1. **Digestive health:** Flaxseeds are an excellent source of fiber, which can help regulate bowel movements and prevent constipation. The fiber in flaxseeds also helps promote the growth of healthy gut bacteria.
2. **Cardiovascular health:** Flaxseeds contain high levels of alpha-linolenic acid (ALA), which is a type of omega-3 fatty acid. ALA has been shown to help lower blood pressure and reduce the risk of heart disease.
3. **Anti-inflammatory properties:** Flaxseeds contain compounds that have anti-inflammatory properties, which may help reduce inflammation in the body and prevent chronic diseases.
4. **Hormonal balance:** Flaxseeds contain lignans, which have weak estrogen-like effects in the body. These compounds may help balance hormone levels and reduce the risk of hormone-related cancers, such as breast cancer.