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# The Review Based on Nutracuticals: Types and Their Function in Various Diseases

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**ABSTRACT:** The concepts "pharmaceutical" and "nutrition" are combined to form the term "nutraceuticals". In general, they are used to describe foods or food ingredients that support and enhance regular physiological processes, therefore enhancing general health. Nutraceutical-rich fruits and vegetables are essential for balanced diet. Population expansion and greater than consciousness are the main factor driving the rising demand for nutraceuticals worldwide. Nutraceutical food items fall into a number of categories, including polyunsaturated fatty acids, antioxidants, herbal or probiotics, dietary fibers and different natural foods. Scientists and researchers are now more interested in the advantages of nutrients because of the pharmaceutical industry's identification of them as therapeutic agents.

**Keywords:-**Nutraceuticals, Nutrition, Health benefits, Dietary supplements, Antioxidant, Probiotic.

## I. INTRODUCTION:-

Nutrition and Pharmceutical both are combined to develope Nutraceutical by DeFelice in 1989 .It was initially described as a meal or substances that offer health or medical advantages, such as illness prevention and therapy.[1]

They help keep a person healthy and lower the chances of getting different diseases. As more people around the world recognized the connection between good nutrition and overall health, the idea of "nutraceuticals" was developed.[2]

The use of nutraceuticals as a supplemental treatment is the foundation of nutritional therapy. Food has health promoting properties in addition to providing nutrients and energy. They help detoxify the body, support healthy digestion, and improve dietary habits.[3]

The consciousness about the nutrition, medicine has significantly transformed perspectives on food, health, and agriculture, leading to major advancements in these areas. With the latest progress in medical and nutritional research, natural products and foods that support health have gained widespread interest among healthcare experts and the general public alike.[4,5]

**Fig No:-1**

Nutraceuticals are sold in concentrated forms, such as pills, capsules, and powders, or as single components or in combination with other

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substances. Extracts, both herbal and non-herbal, are in high demand worldwide. For instance, ginkgo biloba is extensively utilized to improve cognitive function, while green tea is frequently used for weight loss and cancer support.[6]

A single fruit or vegetable can contain up to 100 different phytochemicals. Fruits and vegetables that have bright colours — such as yellow, red, green, blue, and purple — tend to be rich in phytochemicals and nutrients. They support the body's defence against oxidative damage and can be beneficial in reducingchronicdisease and decreasingthe aging process.[7]

The word "nutraceutical" is formed by combining "nutrient" (a substance from food that provides nourishment) and "pharmaceutical" (a medicinal drug). Nutraceuticals are products that may include naturally occurring substances intended for disease prevention or treatment, though they are not always classified as generally safe.[8]

Plants serve as one of the most valuable sources of food and medicine for humans. Recent progress in medical and nutritional sciences has drawn great interest from both professionals and the public toward natural products and health-enhancing foods. [9,10,11].

**Fig No:-2**

**Concept of nutraceuticals:-**

In pharmaceutical development, clinical trials involving animal studies are mandatory to confirm therapeutic effects. In contrast, nutrition lacked such verification methods for disease prevention in the past. However, with growing scientific evidence linking food components to lifestyle-related diseases, the issue has gained social importance. Nutraceutical products are now recognized for their potential to promote health by reducing the possibility of conditions such as hypertension, Cancer, high cholesterol, Diabetes, etc. Additionally, some are marketed for benefits like improving hair growth, skin health, confidence, and relief from varicose veins, alcoholism, depression, and fatigue. As a result, nutraceuticals are increasingly regarded as an effective approach for disease prevention.[12-18]

**Fig No:-3 Concept of nutraceuticals**

**Types of nutraceuticals:-**
**1.Conventional:-**
**2.Unconventional:-**
• Fortified Nutraceuticals
• Recombinant Nutraceutical

**3.Materials having proven nutritional purposes:-**
• Vitamins
• Minerals

**4.Botanicalitems or herbs**
**5.Substance obtained from different sources**
• Flavonoid
• Chondroitin sulphate

**6. Functional foods**
**7. Probiotics and Prebiotics**

**1.Conventional Nutraceutical:-**

Foods that are unprocessed and maintain their natural state fall under this category. Their constituents are found in nature and have active qualities that improve health. For instance,

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lycopene, which is present in tomatoes, guava, and watermelon,papaya, has antioxidant properties and helps prevent the growth of malignancies like leukemia, bladder, and cervix.[19]

**2.Unconventional Nutraceutical:-**

In order to improve overall nutritional quality, this class of nutraceuticals comprises adding nutrients or dietary components to increase the nutritional value. For example, carrots, oranges, tangerines, and other fruits and vegetables contain β-carotene, which has antioxidant, anti-carcinogenic, and anti-cancer qualities. It also protects the cornea from UV rays and neutralizes free radicals.[19]

**• Fortified Nutraceutical:-**

The technique of adding micronutrients—essential vitamins and trace elements—to foods to increase their nutritional worth and efficacy is known as food fortification. One example is cholecalciferol-fortified milk, which helps treat vitamin D insufficiency.[20]

**• Recombinant Nutraceutical:-**

This category uses genetic engineering and biotechnology to generate foods high in energy, such as cheese and yogurt, or to extract bioactive chemicals via fermentation or enzymatic processes. For instance, increased concentrations of lutein, zeaxanthin, carotenoids, and ascorbic acid have been added to genetically modified gold kiwifruit. Corn, avocado, egg yolk, and spinach allcontain lutein, which has anti-cancer effects. [20-22]

**Fig No:-4**

**3.Materials having proven nutritional purpose:-**

**•Vitamin:-**

Different vitamins roles are crucial for sustaining normal metabolism and overall health. A lack of any vitamin can lead to specific clinical disorders. Hence, many nutraceuticals or nutritional therapies are formulated with essential vitamins such as A, B, C. Since plants are primary origin of vitamins for humans, plant biotechnology is increasingly applied to enhance the vitamin content of various crops.[23]

**Fig No:-5**

**• Minerals:-**

Calcium, iodine, zinc, iron, manganese, magnesium, and other minerals are vital for maintaining human health, and a lack of any of them can lead to severe health issues. These nutrients are obtained from both animal and plant sources. However, in many developing nations, deficiencies of calcium, zinc, and iron are widespread, especially among infants and children. Therefore, improving the levels of calcium, iron, and zinc in plant-based foods is considered a key approach to strengthen mineral nutrition.[23]

**Fig No:-6**

**4.Botanical items or herbs:-**

Herbal or botanical goods are derived in the form of extracts and concentrates. These remedies date back to the origins of human civilization and serve as a vast source for treating both acute and chronic illnesses. India holds one of the oldest documented systems of natural medicine,

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known as “Ayurveda,” which offers many effective approaches to maintaining health. Medicinal herbs also contain a wide range of nutraceuticals as their essential constituents.

**Fig No:-7**

**5.Substances obtained from different sources:-**

**• Chondroitin sulphate:-**

Glycosaminoglycans, which are necessary for the development and maintenance of cartilage, are made from glucosamine. It usually comes from the cartilage of cows or calves. Because it encourages the formation of moisture in joint fluid, which helps lessen stress and make the decomposed cartilage stress free, glucosamine sulphate is used as the main treatment for arthritis in a number of European nations. Proteoglycan production is increased by glucosamine in a dose-dependent manner, according to laboratory research. Collectively sold as hydrochloride or sulphate salts, together in which have anti sweeling qualities. Glycosaminoglycan in cartilage, chondroitin, is frequently mixed with glucosamine to increase the tissue's durability and strength.

**• Flavonoid:-**

In plants, flavonoids are the main active nutraceutical chemicals. They possess the effects against oxidative damage, microbial infections, bacterial infections, fungal, viral as well as ulcer, diabetes also cancer etc activities are just a few of the many advantageous effects they share with other phenolic compounds. They possess good effects on the brain.[24]

**6.Functional food:-**

Functional meals offer vital nutrients in quantities greater than those required for basic development and growth.[25].

This category includes various subclasses, such as cereals and fermented foods. The daily used grains are rice, corn, wheat, milletsand have been demonstrated to reduce the problem of blood preesure and also decrease the problems of heart .[26,27]

Strong antioxidant qualities and substantial protective effects against diabetes and cardiovascular disorders have been discovered in kidney beans,soyabeans.[28,29]

Citrus fruits are categorized as functional foods as well as have been shown to have immune boosting , antiviral, properties.[30]

Foods that support a healthy digestive system include fermented milk and its derivatives. For example, yogurt is a highly nutritious fermented food with reported anticancer properties. [31]

**Fig No:-8**

**7.Probiotics and Prebiotics:**

The probiotic group consists of live microbial food components that provide health benefits. They function by attaching to specific sites in the gastrointestinal tract, and their persistence helps in the removal of harmful pathogens.[32-35]

The prebiotic category consists of choosely fermented substances or fibers which encourage beneficial for the gut microbiota also enhance its activity, thereby promoting the host’s health. They act as nourishment for probiotic bacteria in the colon and remain unaffected by stomach acid and digestive enzymes. Examples include inulin, which upon hydrolysis produces oligo-fructose and galactooligosaccharides.[36-40]

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**Health Benefits of Prebiotics**

Although data on the health effects of prebiotics are more limited compared to dietary fibers, research suggests that consuming prebiotics may:

•Decrease the occurrence and duration of diarrhoea caused by infections or antibiotics;

•Reduce inflammation and alleviate symptoms related to inflammatory bowel disease;

•Provide protective effects against colon cancer;

•Lower certain risk factors associated with cardiovascular disease**.**

**Fig No:-9**

**1.Cancer:-**

Nutraceutical-rich bioactive dietary compounds showsnon cancerous effect. Carotenoids, lycopene, known for their effect aginst oxidation acting as oxygen quenchers. Nutraceuticals also protect cells from DNA damage and inhibit tumour-related DNA transcription.Beta-carotene, present in yellow and orange fruits, shows notable anti-cancer effects, while cruciferous vegetables are linked to a lower risk of colorectal and lung cancers by inhibiting enzymes that stimulate tumour growth.[41]

Flavonoids can inhibit the enzymes responsible for oestrogen production, thereby lowering the risk of oestrogen-related cancers. To help prevent prostate and breast cancer, a wide variety of plant-derived compounds with hormone-like activity, known as phytoestrogens, are recommended. [42]

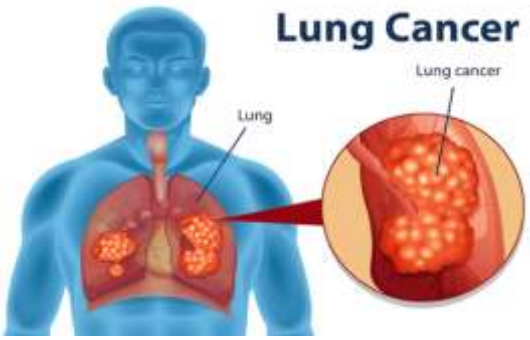


**Fig No:-10**

**2.Diabetes:-**

Numerous plants and nutraceutical agent lower blood glucose level by different mechanisms. There are two types mainly:-

A) Type 1 diabetes which can occurs in 5% population and is an autoimmune disorder.

B) Type 2 diabetes which can affect about 95% population and is associated with obesity. It is also controlled by modification in diet and nutraceuticals.

Gestational diabetes occurs in pregnancy. Use of nutraceuticals rich PUFA'S, Probiotics, Prebiotic, fibers, vitamins, Polyphenols and spices can lower risk of developing diabetes and help to control sugar level.

Herbal dietary supplements rich in nutraceuticals have shown therapeutic potential in managing type 2 diabetes. Broad-spectrum antioxidants such as lipoic acid, catechins, along with spices like fenugreek and cinnamon, are effective in alleviating diabetic complications including neuropathy, nephropathy, and retinopathy. Minerals like magnesium, chromium, calcium, and vitamin D enhance insulin production and help maintain glycaemic control. Natural remedies like bitter melon and pomegranate further support diabetes management by regulating metabolism and facilitating glucose uptake into cells.[43]

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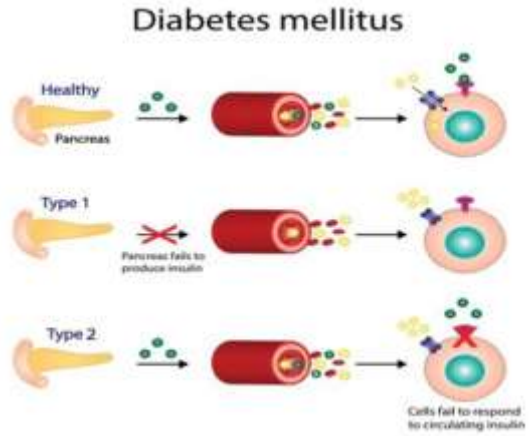


**Fig No:-11**

**3.Cardiovascular diseases:-**

Most of the cardiovascular diseases can be avoided with change in lifestyle especially diet and exercise. Disease related to heart and blood vessels are known as cardiovascular diseases. These are related to process called as atherosclerosis. Different types of Cardiovascular disease are Arrhythmia, Angina, Coronary artery disease, Heart attack ,Stroke. In the treatment of diseases like heart is most useful.

Antioxidants, dietary fibers, vitamins, and minerals show good effect in prevention of cardiovascular diseases. Polyphenols found in grapes help protect against arterial disorders, while flavonoids present in onions, vegetables, grapes, red wineinhibit ACE activity and strengthen capillaries, enhancing oxygen and nutrient delivery to body cell. Rice bran contributes to cardiovascular health byreducing LDL levels, and increasing HDL levels—imbalances in this ratio heighten the risk of coronary heart disease. [44,45]

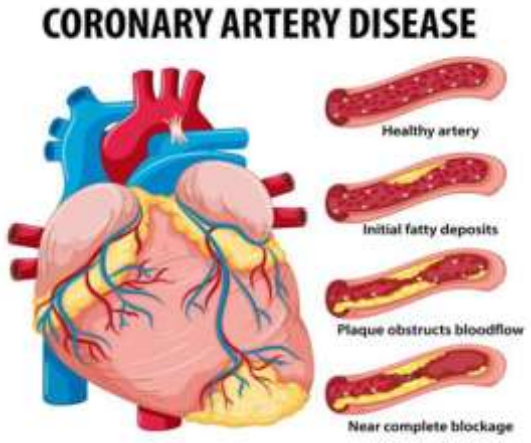


**Fig No:-12**

**4.Oral disease:-**

The concept of odonto nutraceuticals is a newly emerging term. It refers to multifunctional phyto-therapeutic agents used in dental care, that they influence various natural pathways. Examples include green tea, grapes, and cocoa seed extracts. Aloe Vera gel promotes the healing of mucosal wounds and helps relieve pain in patients suffering from oral lichen planus.[46]

Probiotics contribute to the treatment of different oral health issues such as dental caries, gingivitis, periodontitis,and bad breath.

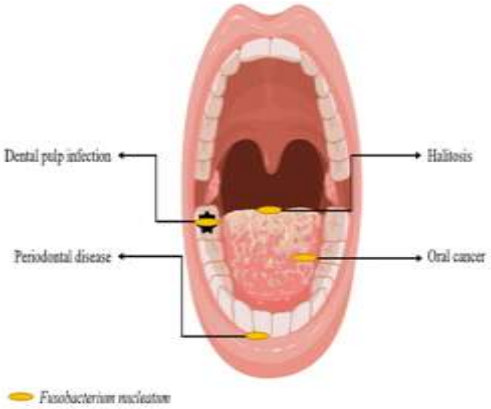


**Fig No:-13**

**5.Alzheimer's disease:-**

Alzheimer's disease, progresses slowly, but antioxidants may help delay its advancement. Nutraceuticals such as beta-carotene, lycopene, curcumin, lutein, and lavandula show activity against oxidation properties that protect neurons from stree of oxidative-related damage. These bioactive compounds can potentially slow the onset and progression of dementia.[47]

β-carotene, curcumin, lutein, lycopene, and turmeric can provide beneficial acts against certain diseases by counteracting oxidative stress, preventing mitochondrial dysfunction, and protecting against different types of neural degeneration.

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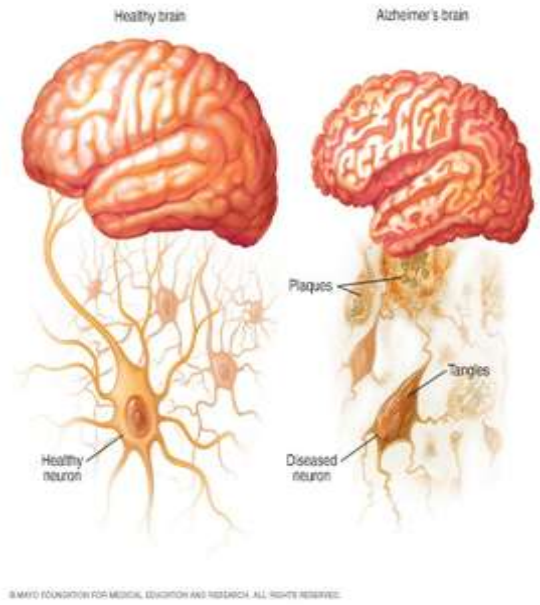


**Fig No:-14**

**6.Parkinson's disease:-**

Due to the neurodegeneartion of the neurons the level of dopamine can be reduced and the cells which produces the dopa can be damaged. Plant-derived compounds such as polyphenols, stilbenes, soy-based phytoestrogens, and unsaturated fatty acids have been shown to protective effects against the Parkinson's disease.[48]

Brahmi acts as a great effect that promotes calmness and relaxation in the brain. It is beneficial in managing migraine, headaches, insomnia, depression, and anxiety. It supports brain cell regeneration, enhances blood flow to the brain, boosts memory performance, and helps regulate hormone secretion.

The vitamine E gives good protection against this disease.Additionally, the creatine was found that influence thesymptoms , as it contributed to reducing clinical signs of the condition.[49]

Nutritional supplements have shown encouraging outcomes in early research, but not have good clinical proofs for the disease.

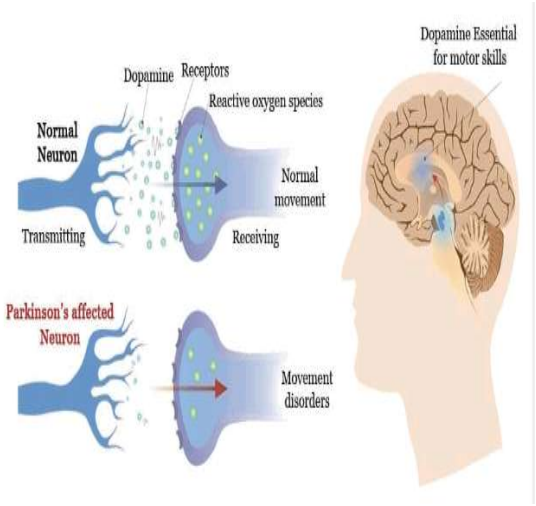


**Fig No:-15**

**7.Stress management:-**

Stress plays an important role in our psychological well-being. Natural bioactive substances known as adaptogens help the body manage stress-related cellular damage. They work to restore balance, supporting to stress management such as ashwagandha and ginseng are which helps suppress stress.

They help regulate physiological functions, support homeostasis, enhance resilience against environmental stress, improve sleep quality, reduce symptoms of depression.[50]

**Fig No:-16**

**8.Osteoarthritis:-**

Osteoarthritis is a complex disease with multiple causes, involving both mechanical and biochemical factors that work together to break down joint cartilage. This condition affects all joint

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tissues and leads to pain and discomfort, which can limit physical activity and contribute to an energy imbalance and subsequent weight gain.

To help manage osteoarthritis symptoms, various nutraceuticals are commonly used, including glucosamine, diacerein, banana, ginger, green tea, pomegranate, curcumin, avocado, soybean. These compounds not only serve as nutrients but also possess pharmacological properties and play a significant role in gene expression regulation.

Antioxidant-rich nutraceuticals, in particular, have shown strong potential in reducing inflammation, relieving pain, and preventing joint damage. Additionally, topical application of olive oil has been found to alleviate pain, stiffness, swelling, and improve physical function and knee joint condition.[51]

**Fig No:-17**

**Applications:-**

Coenzyme Q10 is an antioxidant naturally produced in body present in heart, kidney, liver. It mainly present in meat and seafoods.

Soluble fibres helps to lower blood fat and maintain blood glucose level. Nuts reduce level of LDL cholesterol .Carotenoids decrease the oxidative stress and blood markers of inflammation.

Ginger, a powerful antioxidant with anti-inflammatory properties, is suggested for preventing hypertension and palpitations. Allicin contributes to lowering both blood pressure and cholesterol. [52]

Poly-herbal formulations may work synergistically to effectively reach desired therapeutic outcomes.[53]

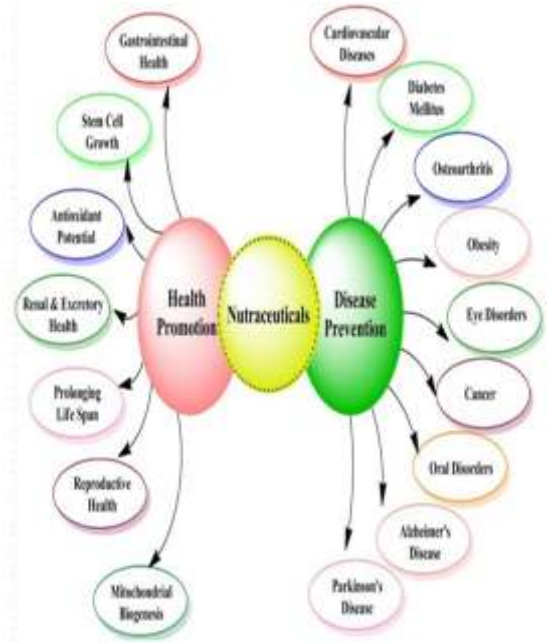


**Fig no:-18**

## II. CONCLUSION:-

Nutraceuticals' potential health benefits and illness prevention capabilities have been proven. The prescribed intake amounts should be followed when consuming them. In the current self-medication environment, nutraceuticals are crucial to the development of new treatments. Their efficacy and acceptance, however, depend on upholding strict requirements for efficacy, safety, purity, and quality. A promising link between nutrition and medicine, nutraceuticals have the ability to prevent and treat a variety of illnesses. Depending on their classification—dietary supplements, functional foods, herbal items, and probiotics, for example—these bioactive substances are essential for the treatment of cancer, diabetes, heart disease, eye disorders, dental illnesses, and stress.

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