



Review on nutraceuticals & its role in ailments of various diseases

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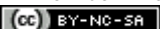
ABSTRACT

Nutraceuticals have received considerable interest because of their presumed safety and potential nutritional and therapeutic effects. 'Nutraceutical' is used to describe a medicinal or nutritional component that includes a food, plant or naturally occurring material, which may have been purified or concentrated, and that is used for the improvement of health, by preventing or treating a disease. In recent years there is a growing interest in nutraceuticals which provide health benefits and are alternative to modern medicine. By using nutraceuticals, it may be possible to reduce or eliminate the need for conventional medications, reducing the chances of any adverse effect. The food products used as nutraceuticals can be categorized as dietary fibre, prebiotics, probiotics, polyunsaturated fatty acids, antioxidants and other different types of herbal natural foods. These nutraceuticals used in various diseases such as obesity, cardiovascular diseases, cancer, osteoporosis, arthritis, diabetes, cholesterol etc. In whole, nutraceutical has led to the new era of medicine and health, in which the food industry has become a research oriented sector.

Keywords: Nutraceuticals, Disease and treatments, Antioxidant, Dietary Fibers.

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INTRODUCTION

Today the exploration and exploitation of the disease fighting properties of a multitude of photochemical found in both food and nonfood plants have created a renaissance in human health and nutrition research. At the same time, many opportunities for the development of novel dietary products have been created. With all new fields of study come new term knew as "Nutraceuticals". A term combining the words "nutrition" (a nourishing food or food component) and "pharmaceutical" (a medical drug), is a food or food product that provides health and medical benefits, including the prevention and treatment of disease.(1)



Fig.1 Concept and Benefits of Nutraceuticals(1)

According to AAFCO, 1996, Nutrient means a feed constituent in a form and at a level that will help, support a life of human being or animal while Nutraceutical means any non-toxic food component that has scientifically proven health benefits including prevention and treatment of disease.

Products isolated or purified from food are sold in medicinal forms not usually associated with food. A nutraceutical have a physiological benefit that it provides protection against chronic diseases. They help to maintain the health of the individual and to reduce the risk of various diseases.(2)



Fig 2. Relation between Nutraceutical, Pharmaceutical and Nutritional supplement.(3)

CATEGORIES OF NUTRACEUTICALS(1)

Nutraceuticals are non-specific biological therapies used to promote wellness, prevent malignant processes and control symptoms. They are categorized as follows

Nutrients: Substances with established nutritional functions, such as vitamins, minerals, amino acids and fatty acids, Common nutrients and their associated health benefits.

Herbals: Herbs or botanical products as concentrates and extracts. Common herbs and their therapeutic relevance.

Table 1: List of nutrients and their relevance

Nutrients	Health benefit
Vitamin A	Antioxidant, essential, for growth and development and in the treatment of certain skin disorders.
Vitamin E	Antioxidant, helps form blood cells, muscles, lung and nerve tissue, boosts the immune system.
Vitamin C	Antioxidant, for healthy bones, gums, teeth and skin, in wound healing, prevent common cold and attenuate its symptoms.
Vitamin B1	Helps to convert food in to energy, essential in neurologic functions.
Vitamin B2	Helps in energy production and other chemical processes in the body, helps maintain healthy eyes, skin and nerve function.
Vitamin B3	Helps to convert food in to energy and maintain proper brain function.
Folic acid	Produce the genetic materials of cells, in pregnancy for preventing birth defects, RBCs formation, protects against heartdisease.
Calcium	Bones and teeth and maintaining bone strength important in nerve, muscle and glandular functions.

Table 2: Herbals used and their therapeutic relevance

Herbals (Botanical source)	Therapeutic activity
Aloe Vera gel (Aloe Vera L. N.L.Burm.)	Dilates capillaries, anti-inflammatory, emollient, wound healing properties.
Ephedra (Ephedra sinica Stapf.)	Bronchodilator, vasoconstrictor, reduces bronchial Edema.
Garlic (Allium sativum L.)	Antibacterial, antifungal, antithrombotic, hypotensive anti-inflammatory
Licorice (Glycyrrhiza glabra L.)	Expectorant, secretolytic, treatment of peptic ulcer
Ginger (Zingiber officinale Rosc.)	Carminative, antiemetic, cholagogue, positive inotropic.

Dietary Supplement: Dietary supplements are products administered through mouth that contain a dietary ingredient intended to add something to the foods you eat. Examples of dietary supplements are black cohosh for menopausal symptoms, ginkgo biloba for memory loss, and glucosamine/chondroitin for arthritis. They also serve specific functions such as sports nutrition, weight-loss supplements and meal replacements. Supplement ingredients may contain vitamins, minerals, herbs or other botanicals, amino acids, enzymes, organ tissues, gland extracts, or other dietary substances. They are available in different dosage forms, including tablets, capsules, liquids, powders, extracts, and concentrates.

TRADITIONAL AND NON- TRADITIONAL nutraceuticals Wide variety of nutraceutical foods are available in the market which falls in the category of traditional foods and non traditional foods.

Traditional Nutraceuticals: Under the category of traditional Nutraceuticals comes food in which no change to the food are made; It is simply natural, whole foods with new information about their potential health qualities. There has been no change to the actual foods, other than the way the consumer perceives them. Many fruits, vegetables, grains, fish; dairy and meat products contain several natural components that deliver benefits beyond basic nutrition, such as lycopene in tomatoes, omega-3 fatty acids in salmon or saponins in soy. Even tea and chocolate have been noted in some studies to contain health-benefiting attributes. Tomatoes and salmon are two types of food that researchers have found to contain benefits beyond basic nutrition - in this case, lycopene and omega-3 fatty acids, respectively.

Nontraditional Nutraceuticals: They are the outcome from agricultural breeding or added nutrients and/or ingredients such as orange juice fortified with calcium, cereals with added vitamins or minerals and flour with added folic acid are nontraditional nutraceutical SSS. Agricultural Scientists successfully have come up with the techniques to boost the nutritional content of certain crops. Research currently is being conducted to improve the nutritional quality of many other crops.

ROLE OF NUTRACEUTICAL IN AILMENTS

A) Cardiovascular disease (CVD): CVD ranks among the most common health-related and economic issues worldwide. Dietary factors are important contributors to cardiovascular risk, either directly, or through their effects on other

cardiovascular risk factors including hypertension, dyslipidemia and diabetes mellitus. Nutraceuticals are natural nutritional compounds, which have been shown to be efficacious in preventative medicine or in the treatment of disease. Several foods and dietary supplements have been shown to protect against the development of CVD. The aim of this review is to present an update on the most recent evidence relating to the use of nutraceuticals in the context of the prevention and treatment of CVD.(4)

POTENTIAL NUTRITIONAL FACTORS FOR CV HEALTH:

The nutraceuticals are foods, parts of food providing medical or health benefits, including the prevention and treatment of disease. They include medicinal products made from natural ingredients. The phytosterols, sterols and stanols are present in a range of plant products including various fruits and vegetables, cereals, seeds and nuts. Polyphenols are phytochemicals in fruits, vegetables, cereal and legumes, and also found in beverages produced from plant products such as tea, coffee, wine and cocoa. These include flavonoids, phenolic acids, stilbenes and lignans. The phenolic compounds are found in grapes and these include anthocyanins, flavanols, flavonols, phenolic acids and stilbenes including resveratrol (3,5,4'- trihydroxy-trans-stilbene). Resveratrol is present in smaller quantity in cranberries, blueberries and peanuts. Spirulina (Cyanobacterium) is a rich source of carotenoids and phycocyanins, and its supplementation has been associated with beneficial alterations in TC and LDL-C concentrations.

MODIFYING CVD AND RETARDING CV AGING:

The nutraceuticals with the potential to modify the plasma lipid profile, retard and potentially reverse atherosclerosis process and reduce the CVD risk. The sterols/stanols reduce LDL-C through reduction in intestinal absorption of cholesterol, upregulation of hepatic LDL receptors and reduced production of endogenous cholesterol. The sterol/stanol consumption is inversely related to circulating LDL-C concentrations. Polyphenols, too, influence plasma lipid concentrations favourably. The flavanols in cocoa products are associated with improvement of lipid profile. Consumption of grapes and grape juice, containing resveratrol, has been linked with improvement in HDL-C levels. Coenzyme Q10 use appears to improve myocardial function and improve endothelial function. Hypertension is another modifiable risk factor for CVD and lowering blood pressure reduces CV risk. Polyphenols consumption of flavonoid-rich fruits and vegetables may lower blood pressure.(5)

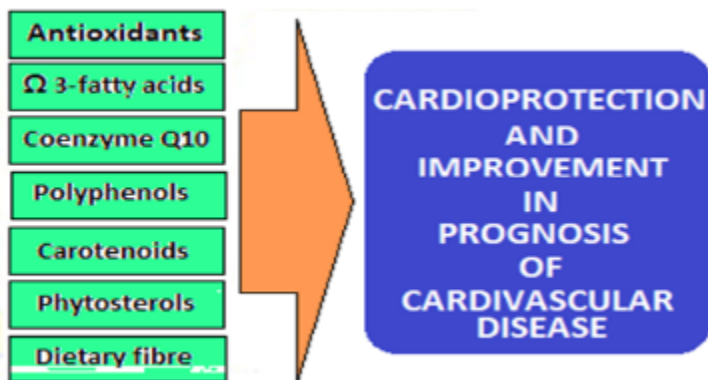


Fig 3: Nutraceuticals for Protection and Maintenance of CV health(5)

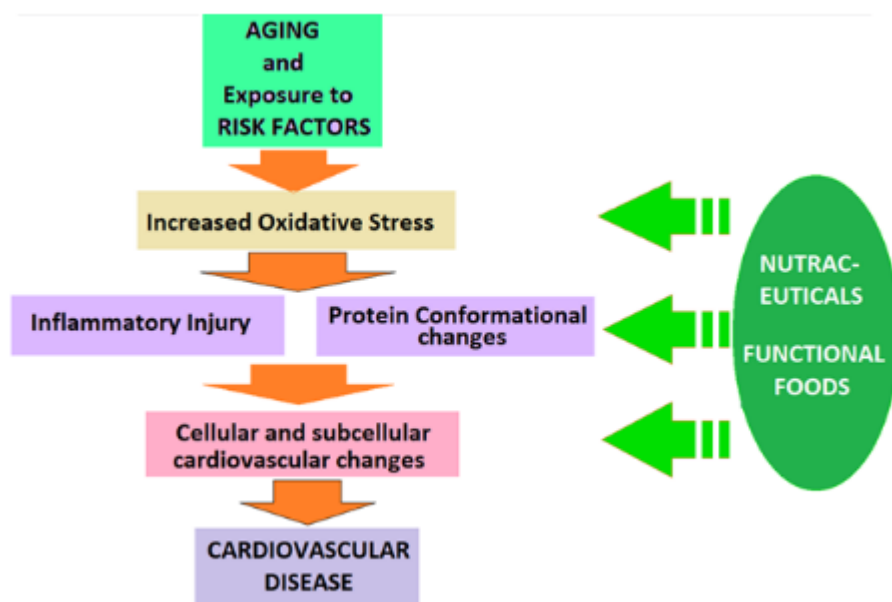


Fig 4. Nutraceuticals and Functional foods and their impact on CV Health(5)

Dietary fibres, Anti-oxidants, Omega-3 poly-unsaturated fatty acids, Vitamins, minerals for prevention and treatment of CVS disease.[6] Polyphenol (in grape) prevent and control arterial diseases. Flavonoids (in onion, vegetables, grapes, red wine, apples, and cherries) block the ACE and strengthen the tiny capillaries that carry oxygen and essential nutrients to all cells. Rice bran lowers the serum cholesterol levels in the blood, lowers the level of (LDL) and increases the level (HDL) in cardiovascular health. Higher the ratio more will be the risk of coronary heart diseases. Rice bran contains both Lutein and Zeaxanthin, which improves eyesight and reduces the chance of cataracts. The essential fatty acids, omega-3, omega-6, omega-9 and folic acid in rice bran are

also promoting eye health. It is reported that low intake of fruits and vegetables is associated with a high mortality in CVS disease.(2)

Various nutraceuticals are used to treat CVS disease are as follow

Phytosterols, Polyphenols, Flavonoids, Vitamin E, Curcumin, Omega-3-fatty acid, Garlic(2)

B) Diabetes Mellitus

Diabetes Mellitus is a complex metabolic disorder associated with developing insulin resistance, impaired insulin signalling and β -cell dysfunction, abnormal glucose and lipid metabolism, sub-clinical inflammation and increased oxidative stress(6)

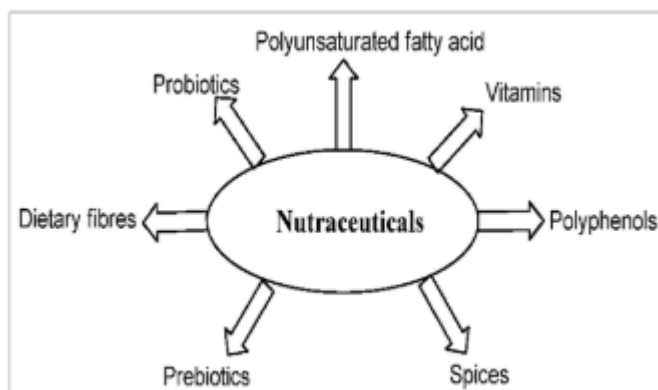


Fig.5 Need for diabetes-preventive nutraceuticals.

Use of ethyl esters[8] of n-3 fatty acids may be beneficial in diabetic patients. Docosahexaenoic acid modulates insulin resistance and is also vital for neurovisual development. Lipoic acid, an antioxidant, for treatment of diabetic neuropathy. Dietary fibers from psyllium have been used for glucose control in diabetic patients and to reduce lipid levels in hyperlipidemia.

Various nutraceuticals are used to treat Diabetes are as follow

Antioxidant ,Vitamin C ,Calcium/Vitamin D , Carbohydrate , Fats , Fibers , Protein(2)

C) CANCER

Nutraceuticals are natural bioactive products with food value and promising therapeutic properties in several diseases. Current cancer treatments, such as chemotherapy, radiotherapy and surgery, induce unintended side effects compromising also health and well-being of patients. Emerging studies suggest that some plant-based agents may impact cellular and molecular processes underlying tumor progression.(7) Nutraceuticals are used to treat chronic disease & improve human health. Flavonoids which block the enzymes that produce estrogen reduce the estrogen-induced cancers. Prevent prostate/breast cancer a broad range of phyto-pharmaceuticals with a claimed hormonal activity, called “phytoestrogens” is recommended. Soyfoods source of isoflavones, curcumin from curry and soya isoflavones possess cancer chemopreventive properties. Lycopene concentrates in the skin, testes, adrenal and prostate where it protects against cancer.(2)

Various nutraceuticals are used to treat Cancer as follow

Chestnut , Berries ,SoSy ,Green tea , Garlic , Ginseng ,Tomato & red pepper , Dietary fibers.(2)

D) IRRITABLE BOWEL SYNDROME

Several nutraceuticals show promising results for the treatment of inflammatory bowel disease with minimal to no side effects. Prebiotics and

probiotics appear to alter the gut microbiome by increasing biodiversity and increasing the production of butyrate, an anti-inflammatory and antineoplastic agent of the gut. Fish oil acts as a direct anti-inflammatory agent as well as an immune regulator.

Prebiotics: are nondigestible fibrous products that selectively promote the growth or activity of commensal microorganisms that improve the well-being of the host.9 Prebiotics are carbohydrates that are not typically digestible by the human gastrointestinal tract; therefore, they are selectively fermented by commensal bacteria (ie, Bifidobacteria) and provide nutrients for their metabolism. There are multiple different prebiotics including inulin, fructo-oligosaccharides, galacto-oligosaccharides, soybean oligosaccharides, and complex polysaccharides. Fermentation of prebiotics produces short-chain fatty acids including butyrate, which has anti-inflammatory properties, promotes colonic epithelial integrity and healing, reduces neoplasia, and more.

Probiotics: are defined by the World Health Organization as “live micro-organisms which, when administered in adequate amounts, confer a health benefit on the host.” Probiotics aim to alter the microflora of the intestines to a more favorable subset of organisms that may have anti-inflammatory and gut healing properties. An increase in commensal bacteria and decrease in proinflammatory organisms such as *Escherichia coli*, *Enterobacter aerogenes*, *Klebsiella pneumoniae*, *Streptococcus viridans*, *Bacterioides fragilis*, *Bacterioides uniformis*, and *Clostridium ramosum* can promote the production of short-chain fatty acids (SCFAs) such as butyrate. SCFAs lower the pH of the colon and therefore prohibit the growth of pathogenic organisms. In addition, probiotics may decrease intestinal permeability and improve the barrier function of the intestines. Probiotics also down regulate proinflammatory mediators and induce T regulatory cells to dampen damaging autoimmune responses.(8)

Various nutraceuticals are used to treat IBD as follow

Curcumin, Aloe Vera, The Bael, Garlic, Honey, Probiotics, Minerals.(2)

E) Gastrointestinal Disorders

Nutraceuticals are mostly used to prevent, rather than to treat, disease. However, there is and growing evidence that targeted nutraceuticals may help cure diseases lik osteoarthritis, metastatic cancer, and GI disorders.(9)

Eating habits and trends in food production and consumption have health, environmental and social impacts. Diet has implications on gut health. Gut complications, such as ulcerative colitis, Crohn's disease, irritable bowel syndrome, and gluten therapy resistant celiac, result from overgrowth and imbalance of intestinal microbial flora, and are related to one's diet.

Gut health determines an individual's overall health. The human gut has the following functions:

- (a) it breaks food down to nutrients,
- (b) it facilitates absorption of nutrients into the blood through intestinal walls, and
- (c) it prevents foreign and toxic molecules from entering the bloodstream. Gut malfunction,

therefore, has a direct negative impact on human health. This review focuses on the role of functional foods, nutraceuticals, and food supplements in intestinal health. Nutraceuticals are widely used (maximum) in treatment in GI disorders.

Various nutraceuticals are used to treat GI disease as follow

Curcumin, Anti oxidant, Aloe Vera, The Bael, Garlic, Honey, Probiotics, Minerals, Carbohydrate diets, Dietary fibers.(2)

F) Osteoarthritis

Arthritis is a chronic disease of joints. It is highly prevalent, particularly in the elderly, and is commonly associated with pain that interferes with quality of life. Many botanic and animal products such as green tea and fish oil have been traditionally used by OA patients for pain management, which by definition makes them nutraceuticals. Emerging evidence indicates that the efficacy of these natural products on OA pain relief rely on certain ac-tive ingredients which are enriched in these natural sources, such as epi-gallocatechin 3-gallate (EGCG) that is enriched in green tea.(10)

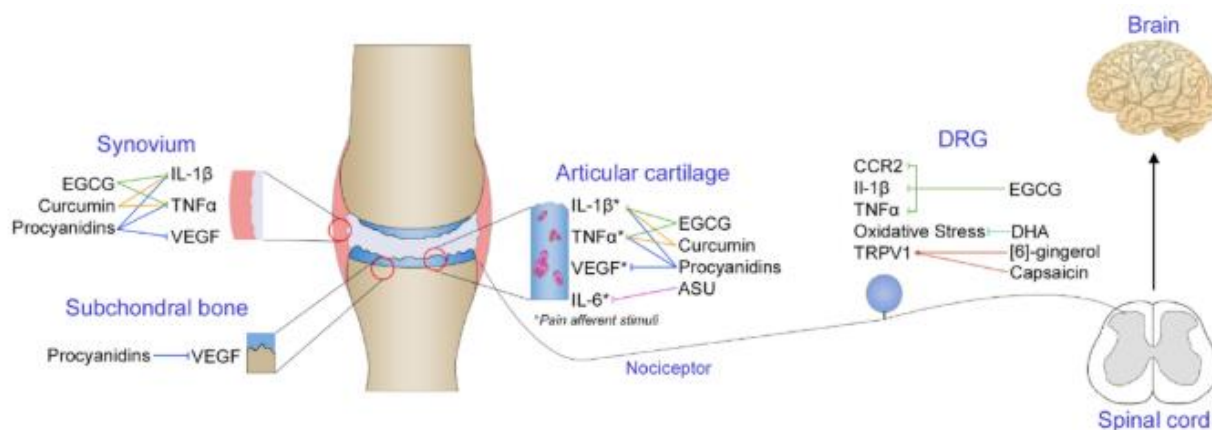


Fig 6. Nutraceuticals and their potential molecular targets in mitigating OA pain. Nutraceuticals have the potential to modulate expression of pain afferent stimuli in the articular joint tissues such as the synovium, cartilage, and subchondral bone, and activity of pain mediators in the DRG in patients with OA.(10)

G) Parkinson's Disease

Current pharmacological strategies for Parkin-son's disease (PD), the most common neurological move-ment disorder worldwide, are predominantly symptom relieving and are often plagued with undesirable side effects after prolonged treatment. Despite this, they remain as the mainstay treatment for PD due to the lack of better alternatives. Nutraceuticals are compounds derived from natural food sources that have certain therapeutic value and

the advent of which has opened doors to the use of alter-native strategies to tackle neurodegenerative diseases such as PD. Notably, nutraceuticals are able to position them-selves as a "safer" strategy due to the fact that they are naturally derived compounds, therefore possibly having less side effects. Significant efforts have been put into better comprehending the role of nutraceuticals in PD.(11)

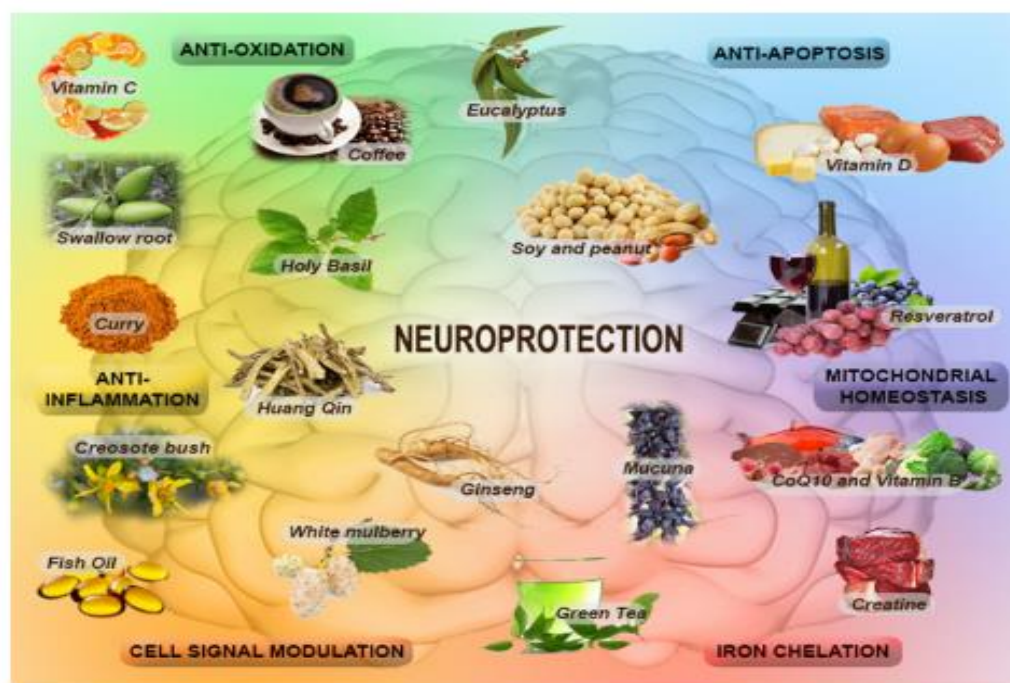


Fig.7. Nutraceuticals for PD can be grouped broadly into six themes based on their neuroprotective properties: (1) iron chelation; (2) cell signalling modulation (3) anti-inflammatory; (4) anti-oxidation; (5) anti-apoptosis; and (6) mitochondrial homeostasis. (11)

CONCLUSION

The nutraceutical manufacturing industries are growing at a rate far exceeding expansion in the food and pharmaceutical industries. Nutraceuticals have proven their health benefits and disease prevention capability, which should be taken according to their acceptable and recommended intake. In the present scenario of self-medication nutraceuticals play a major role in therapeutic development. But their success depends on

maintaining on their quality, purity, safety and efficacy. Nutraceuticals refer to foods having a medicinal effect on the health of human beings. They consist of food supplements, herbal products, probiotics and prebiotics, medical foods meant for prevention and treatment of diseases. Major nutraceuticals possess multiple therapeutic effects with a lack of unwanted effects hence attract more consumer interest. Increase in shift towards preventive therapies.

REFERENCES

1. G Ca. *et al.* Role of Nutraceuticals In Various Diseases : A Comprehensive Review 2013; 3(2): 290–9.
2. Article R. *et al* Sciences A. A review : nutraceuticals & its role in ailments. 2020;9(5):499–510.
3. Shinde N. Nutraceuticals : A Review on current status Nutraceuticals : A Review on current status. 2014; (March).
4. Sosnowska B. *et al* The role of nutraceuticals in the prevention of cardiovascular disease. *Cardiovasc Diagn Ther.* 2017;7(Suppl 1):S21–31.
5. Nihra.V. Nutraceuticals for Improving Cardiovascular Health and Prognosis in Cardiovascular Disease. *Ec Nutr.* 2018;(October).
6. Nimesh S, Nimesh VD. Nutraceuticals in the management of diabetes mellitus. 2018;6(2):114–20.
7. Ranzato E. *et al* Role of Nutraceuticals in Cancer Therapy. *J Food Res.* 2014;3(4):18.
8. Parian AM. *et al.* Nutraceutical Supplements for Inflammatory Bowel Disease. 2015;
9. Banerjee A, Giri R. Nutraceuticals in Gastrointestinal Disorders. 2016;109–22.
10. Wang A *et al.* Nutraceuticals and osteoarthritis pain *Pharmacology & Therapeutics Nutraceuticals and osteoarthritis pain. Pharmacol Ther [Internet].* 2018;(April). Available from: <https://doi.org/10.1016/j.pharmthera.2018.02.015>
11. Hang L *et al.* Nutraceuticals in Parkinson's Disease *Nutraceuticals in Parkinson's Disease. NeuroMolecular Med.* 2016;(May).