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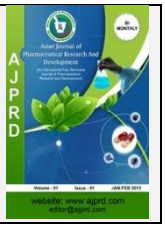

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Review Article

Nutraceuticals: A Review of Their Therapeutic Benefits and Health Implications

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A B S T R A C T

Nutrition and medication are combined to form nutraceuticals was invented in 1989 to define materials that could be second hand as nutriments that have well-being paybacks. Widely construed, nutraceuticals are nutrients or components of nutrients that play a significant part in adapting to and maintaining the regular physiological functions necessary to maintain healthy human beings. Nutritional fibres, probiotics, prebiotics, polyunsaturated fatty acids, antioxidants, spices, phytochemicals and other diverse kinds of herbal/natural nutrients can all be categorised as nutrient items utilised in nutraceuticals. Healthcare branch focused on the all features about the nutraceuticals, ranging from systematic parts to medical trials, from efficiency studies to valuable effects on well-being status. Nutraceuticals describe themselves as a natural and essential component of our daily diet. These nutraceuticals aid in the fight against some of the most pressing health issues of the day, including obesity, heart disease, cancer, osteoporosis, arthritis, diabetes, and cholesterol. Herbal nutraceuticals are utilised as a potent weapon for maintaining health and fighting major, chronic diseases that are brought on by poor nutrition, thereby encouraging the best health, longevity, and quality of life.

Keywords: Nutraceuticals, Nutrients, well-being, Health.

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INTRODUCTION

Nutraceuticals are a growing class of natural products that break the relationship between nutrition and medication. Stephen De coined the word "nutraceutical" by combining the words "nutrition" and "pharmaceutical".

Felice founded the Groundwork for Innovation in Medicine in Cranford, New Jersey, and served as its chairman in 1989. Nutraceuticals, in De Felice's definition, are "a food (or component of a diet) that gives pharmacological or well-being uses, together with the suppression and therapy of a disorders". A nutraceutical, on the another side, is defined by Health Canada as "a product derived from food material, but synthesized and offered in the form of tablets, capsules, or powder form, or in another therapeutic form, not normally corresponding with foods"(1).

Any non-toxic dietary supplement with scientifically proven well-being uses for disease prevention and cure is referred to as a nutraceutical. According to Roberfroid, an efficient diet is one that "should have a related effect on health and well-being or results in a decrease in illness risk" in the context of this examination (2,3). The concept of nutraceuticals is not brand-new. Along with their conventional therapeutic technique, societies as diverse as Indian, Roman, Sumerian, and Chinese were using it at the time. The use of diet as remedy, commonly termed “nutritional therapy” these days. Underneath nutritional therapy, the practice of medications was minimum chosen and as an alternative practice of medications, preference for moral diet to avoid and treat ailments were preferred(4). The innovative routine accepted by society nowadays has transformed the elementary diet traditions of the later.

Over weightness is nowadays known as a worldwide problem. Heart disease remains to be Most common cause of death

worldwide, followed by cancer, osteoporosis, arthritis, and a host of other conditions. Customers who find the exclusive, cutting-edge, disease-action approach in the current drugs irritating are looking for similar or alternative advantageous items and the red tape of obtained attention styles nutraceuticals. The adage, coined by Hippocrates nearly 2,500 years ago, "Let diet be the medication and cure be the die", is undoubtedly true today. An Ayurvedic proverb says, “When diet is wrong, medicine is of no use; when medicine is correct, medicine is of no need”(4-6).

Types of nutraceutical

Types of nutraceuticals include those used for academic instruction, clinical trial design, the creation of functional foods, and dietary advice. Nutraceuticals can be prearranged in many cultures. On the basis of nutrient sources, biological mechanisms, chemical composition, and other factors, one can develop some of the most reliable routines for classifying nutraceuticals.

The natural nutrition sources used in nutraceuticals fall into the following categories (1):

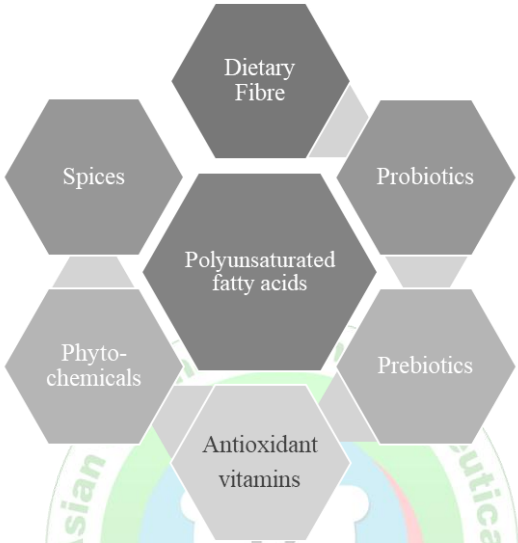

Figure 1: Types of Nutraceuticals

Nutraceuticals are made from diets of vegetable or animal source, and the present consideration and continuing global research goals to shed light and completely /explain their mechanism of action, their safety and efficiency by verifying their title role by sources of medical facts. This Distinct Problem is devoted to the role and perceptions of nutraceuticals in social well-being, inspected from different views, extending since analytical parts to clinical trials, from efficiency lessons to beneficial goods on wellbeing situations (7-8).

Dietary Fibres

Dietary fibre is the portion of the diet, more specifically the natural products obtained from, that is absorbed by the microflora in the intestines rather than being broken down by digestive system enzymes one's intestines. Comparing those who consume substantial amounts of nutritional fibre to those who consume little or no fibre, the risk of cardiac heart disorder, stroke, hypertension, diabetes, obesity, and various gastrointestinal (GI) problems is low. A higher intake of a diet high in fibre also decreases blood pressure, improves blood glucose control for diabetics, promotes regularity, and restores serum lipoprotein levels. Study discloses that some soluble fibres increase the resistance in humans(9).

Nutritional supplements are focused formula of nutrients; obtainable is available for humanoid ingestion in liquid, capsule, tablet, soft gel, lozenge, chewable, gel caps, and powder form. A nutritional supplement or diet supplement is any food item which carries at least one of the nutrients listed below-vitamins, minerals, amino acids, antioxidants, cholesterol-lowering agents, blood pressure-lowering agents, stimulants, and antidepressants and is intended to be consumed in place of regular food for health purposes (10-11).

Dietary supplements fall into one of three categories based on their source:

a. **Natural:** These are made entirely of organic materials like rock and ocean, or 100% natural sources like plants and animals. Cod liver oil and supplements containing spirulina are examples of natural extracts.

b. **Semi-synthetic:** These extracts, like food for baby, tomato sauce, and powdered milk, are taken from natural sources and then chemically altered.

c. **Synthetic:** These extracts are produced through chemical synthesis in an atypical way. Amino acids and vitamins with a synthetic look are examples of artificial dietary supplements(5,9).

NSP (Non-starch polysaccharides) include hemicelluloses, celluloses, lignin, gums and pectin, resistant dextrin, and resistant starches are widely found in dietary fibres. Fruits, oats, barley fibre, and beans are among the foods high in soluble fibre.

Dietary fibres can be separated into two groups on the basis of their water solubility:

a. **(SDF)**stand for soluble dietary fiber, which is made up of colon-fermented-glucans, pectins, gums, mucilages, and hemicelluloses.

b. **(IDF)** stands for insoluble dietary fibre, which comprises celluloses, certain hemicelluloses, and lignins and is fermented in the colon till the extended limit.

Together, the insoluble dietary fibre (IDF) and soluble dietary fibre (SDF) complexes are known as non-starch polysaccharides(9,27).

Probiotics

Probiotics, which meaning "for life", might be interpreted by a layperson as "good bacteria or buddy bacteria". As per the history of probiotics the fermented milk was first time consumed by dates back, which was over 2,000 years ago. A probiotic is a living microbial feed supplement that, when consumed in moderation, benefits the host animal by regulating the microbial balance in its intestines.

Bacteria from the following classes are typically present in probiotics:

Table 1 : Classification of Probiotics

Sr. No.	Bacteria	Example
1.	Lactobacilli species	L. acidophilus, L. casei, L. delbrueckii subsp. bulgaricus, L. brevis, and L. cellobiosus
2.	Gram-positive cocci	Enterococcus faecalis, Streptococcus salivarius subsp. thermophilus, and Lactococcus lactis
3.	Bifidobacteria	B. bifidun, B. adolescentis, B. infantis, B. longum, and B. thermophilum

Probiotics can be found in many different formulae, such as powdered medication, liquid, gel, paste form, granules, capsule, etc. Certain types of probiotics are frequently used for the treatment of gastrointestinal (GI) disorders include lactose intolerance, severe diarrhoea, and GI side effects brought on by antibiotics. Probiotics are non-pathogenic, non-toxic, resistant to gastric acid, and obedient to the gut epithelial tissues that produce antibacterial substances. There are indications that taking probiotics lowers your chance of developing systemic conditions like allergies, asthma, tumour, and a number of other ear and urinary tract infections (12).

Elie Metchnikoff, a Nobel laureate from the Pasteur Institute in Paris, successfully transformed the poisonous microflora of the large intestine into a health-friendly culture of Bacillus bulgaricus, leading to an improvement in the host's quality of strength. This work revealed the probiotics' valuable properties for humans (5,13).

Prebiotics

Prebiotics are nutritional components that positively affect the host by selectively changing the structure or metabolism of the GI microbiota. Improvements in lactose tolerance, anticancer characteristics, toxin neutralisation, lowering of blood lipids, blood cholesterol, and constipation as well as stimulation of the gut immune system are only a few of the health benefits of prebiotics. Bifidobacterium thrive when given oligosaccharides and 5–20 g of insulin each day. Once more, eating a lot of these oligosaccharides results in diarrhoea, stomach distension, and gas. Gastrointestinal disturbances, loss of hair follicle, white blotchy nails, exhaustion, irritation, and slight nerve damage all play a significant part in treatment (14).

A prebiotic is a "nondigestible food element that helpfully impacts the host by selectively encouraging the production and/or action of one or a restricted number of bacteria in the colon, and thereby enhances host health," according to Gibson and Roberfroid's 1995 explanation of prebiotics. This description has since undergone numerous revisions. According to Reid et al., "nondigestible materials that deliver a beneficial physiological effect on the host by selectively stimulating the positive development or action of a limited number of indigenous bacteria" were described as having this effect in 2003".

Prebiotics naturally occur in numerous nutritional diet foodstuffs such as peas, beans, pea shoots, sugar beet, garlic, chicory, onion, Jerusalem artichoke, wheat, honey, banana, barley, tomato, rye, soybean, human and animal milk, etc., and more recently, seaweeds and microalga. In addition, a great deal more are produced synthetically utilising basic materials including lactose, sugar, starch, and plants. The three that are currently most well-known are GOS, FOS, and inulin (15).

Polyunsaturated Fatty Acids

Polyunsaturated fatty acids (PUFAs), which come from diet and are required for the body function, are referred to as "essential fatty acids" (EFAs). PUFAs fall within one of two categories.

a. **Omega-3 fatty acids (N-3)**

b. **Omega-6 fatty acids, second.**

Docosahexanoic acid, eicosapentanoic acid, and -linolenic acid are the three primary omega-3 fatty acids (DHA). Prior to EPA and DHA, there is ALA. The main sources of EPA and DHA are fish oils and fatty fishes including mackerel, salmon, herring, trout, and blue fin tuna. The majority of4vegetable oils, such as corn, safflower, soyabean, Sunflower, to contain LA

PUFA directly regulates systemic and local inflammation that underlies plaque initiation, development, and instability in addition to reducing plasma triglycerides, blood pressure, and platelet aggregation. Depending on the position and number of double bonds, PUFAs regulate a number of biological

functions, including blood pressure and blood coagulation as well as the normal development and operations of the brain and neurological system (16).

From the past years, there has been a lot of public interest in the connection between diet and health. Dietary lipids' effects and the knowledge that particular dietary fats. The impact of acids on human health has been a major area of focus. One's health and nutritional well-being are influenced by the position of double bond of omega, the level of unsaturation, and the chain length of fatty acids. The majority of dietary oils and (fats) lipids from both plant and animal sources are made up of fatty acids. As the primary components of phospholipids, triglycerides, and cholesterol esters, fatty acids play significant structural, Physiological, and metabolic roles in the body (17).

Antioxidant Vitamins

A substance that prevented the consumption of oxygen was first known as a antioxidants. Early researchers worked on and studied about the role of antioxidants in biology focused on how to use them to halt the oxidation of unsaturated lipids, which causes rancidity. A substance that is stable enough to provide an unchecked free radical an electron and neutralise it, reducing the radical's potential for harm, is an antioxidant. Delaying or limiting cellular damage is principally caused by these antioxidants' capacity to scavenge free radicals. Vitamins like vit. C, vit. E, and carotenoids are examples of antioxidant vitamins. These vitamins, which are present in large quantities in many fruits and vegetables, shield us from harm by acting as free-radical scavengers(18).

Antioxidants are primarily split into two categories:

Table 2: Types of antioxidants

Sr. no.	Types	Example
1.	Enzymatic	catalase, glutathione systems, and superoxide dismutase (SODs)
2.	Non-Enzymatic	melatonin, glutathione, ascorbic acid, and uric acid

Oxidative stress has been linked to several of disorders, which includes atherosclerosis, inflammatory disorders, certain cancers, and the ageing process.

Hemochromatosis, acquired immune deficiency disorder, emphysema, organ transplantation, ulcers of GI tract, hypertension, and preeclampsia are all believed to be caused by oxidative stress. Swelling or inflammation disorders include arthritis, vasculitis, glomerulonephritis, lupus erythematosus, old-age respiratory disorder syndrome, and intestinal ischemia. Antioxidants and other nutritional supplements are used to treat the aforementioned conditions (4,19).

Classification of antioxidant based on plant source

- **Natural**
- **Synthetic**

Brain ischemia, Parkinson, Subarachnoid haemorrhage, Alzheimer, epilepsy, Huntington, and depression are a few neurological illnesses. Treated with antioxidants, including prostate cancer. Additionally, it can be utilised for a variety of oral, dental, and skin conditions (19).

Phytochemicals

Phytochemicals, which are natural components derive from plants with distinct bio-activities toward mammalian biochemistry and biotransformation, are mainly studied for their properties to provide wellbeing uses. As substrates for biological and chemical responses, related factors of enzymatic chemical reactions, enzyme inhibitors, absorbents, sequestrants that attach to and remove unwanted ingredients in the gastrointestinal lining, ligands that agonise or antagonise cell surface or intracellular receptors, harmful reactive or toxic chemicals, scavengers of reactive or toxic chemicals, scavengers of reactive or toxic chemicals, scavengers of reactive or toxic. Fiber, terpenoids, phenolic, and alkaloids are some of these phytochemicals (20).

A number of diseases, including tumour, cardio-vascular disorders, diabetes mellites, increased blood pressure, swelling (inflammation), microbial infection, viral infection, and parasitic infections, mental regardless, spasmodic disorders, ulcerated patches, and more have been proven to be protected against by phytochemicals. The use of phytochemicals in therapeuticapplications, animal research, and cells generated in culture or in vitro is explained in advance. Anti-psychotic phytochemicals in vitro testing, impact on pain and inflammation in animals, effects on viruses, parasites, and bacteria, cancer, Promyelocytic leukaemia cell culture studies, anti-mutagenic testing, etc. The food and pharmaceutical industries must meet issues as a result of the rapidly expanding usage of phytochemicals in nutraceuticals and functional foods. We believe that because phytochemicals are incorporated into our bodies, they can improve overall health and help treat various disorders (21).

Spices

In addition to their traditional usage as diet additions to increase the excellence of foods, spices have long been used in old method of medication because they have therapeutic effects that are favourable for human health. Spices have been included into diet since 5000 BC. Spices may be the first functional food ever because they provide bioactive, which have a significantbeneficial impact on human health.

Numerous researches on animals and clinical trials have lately provided empirical support for the health-promoting properties of many of these common food additives. The antioxidant qualities of the bioactive compounds present in spices are of particular importance due to the role that oxidative stress plays in the development of degenerative disorders such cancer, inflammatory disease, cardiovascular disease, and neurological disease. Beyond their role in giving our food flavour and taste, spices should be viewed as a natural and essential part of our daily nourishment. They stimulate digestion, treat digestive issues, and some spices

have antibacterial properties. They have qualities like tonicity, carminativeness, stomachicness, diureticness, and antispasmodicness (22).

Some of the spices that are used in daily meals and have nutritional benefit include:

Table 3: List of the spices

Sr. no.	Spices	Scientific name
1	Curcumin	Curcuma longa
2	Capsaicin	Capsicum annuum
3	Piperine	Piper nigrum
4	Gingerol	Zinger officinale
5	Eugenol	Eugenia caryophyllus
6	Allicin and S-allyl cysteine	Allium sativa
7	Quercetin	Allium cepa

Several of the health benefits of spices have been experimentally verified throughout the last three decades. Despite the paucity of human research, in vitro and in vivo animal studies' promising findings have received a lot of attentions. cardiovascular protection, gastrointestinal stimulant activity, antidiabetic potential, anti-atherogenic, anti-lithogenic, and anti-inflammatory characteristics Among the different health advantages of spices are their antioxidant and antimutagenic properties, as well as their ability to prevent cancer (23,24).

Table4: List of the nutraceuticals mostly used these days (25, 26)

Sr. no.	Nutraceuticals	Examples
1	Dietary fibres	Barley, flaxseed, psyllium, dried beans, lentils, peas, oat bran, and soy milk bran The skins of fruits and vegetables, nuts and seeds, dried beans and bran from wheat, corn and rice
2	Probiotics	Bifidobacterium, Kefir, Lactiplantibacillus plantarum, Lactobacillus acidophilus, Limosilactobacillus reuteri, Lactobacillus rhamnosus, Saccharomyces boulardii, Lactobacillus casei
3	Prebiotics	beans, pea shoots, sugar beetroot, onion, garlic, chicory and onion; Jerusalem artichokes; wheat; honey; banana; barley; tomato; rye; soybean; and, more recently, microalgae and seaweeds
4	Polyunsaturated Fatty Acids	Omega 3, linoleic acid, arachidonic acid, flaxseed, nuts, canola oil, soybean oil, hemp seeds, almonds, and oily fish
5	Antioxidant vitamins	beta-carotene (found in spinach), red wine, flavonoids (found in green tea), indole (found in broccoli), lignans (found in sesame seeds), lycopene (found in pink grapefruit), manganese (found in almonds), vitamin A (found in sweet potatoes), and vitamin E (found in avocados)
6	Phytochemicals	α and β-carotene from mango pulp, Xanthophylls from pumpkin, Myrcene from essential oil extracted from lemongrass, Sitosterol from hazelnut oil, Arabinoxylan from finger millet
7	Spices	Ginger (Adrak), Cumin (Zeera), Star anise (Chakra Phool), Pepper (Kaali Mirch), Nutmeg (Jaiphal), Garlic (Lassan), Coriander (Dhaniya), Cumin (Zeera), Cinnamon (Dalchini), Fenugreek (Methi), Bishop's weed (Ajwain)

Are the dietary and nutritional supplements which are widely used as nutrition with therapeutic uses and also help to cure the dangerous disorders. The ailments like cancer, diabetes mellitus, obesity, cardiovascular diseases, osteoporosis, arthritis, cholesterol, gastrointestinal infections are treated and prevented with the proper intake of nutraceuticals (27-31). Nutraceuticals have minimum or negligible adverse effects which is the greatest advantage. Nutraceuticals and other balance diet food shows important role in biotransformation and other physiological functioning which is beneficial to overcome the risk of various degenerative disorders (33). Nutraceuticals have been regarded for their nutrient density, providing consumers with high-quality protein source in addition to wide variety of critical minerals, vitamins and trace elements (34). Nutraceuticals have received considerable zest for their expected safety, potential nutritive and therapeutic effects (35).

Although some studies have confirmed the positive response but their mechanism of action are still not clear. Nutraceuticals provide a promising source of compounds with many therapeutic effects because they are inexpensive and most of them have no evidence of toxicity (37). They are

convenient to all the age groups due to their high quality, purity, safety, efficacy, promoting health and help to heal disorders. The most recent trend moved towards nutragenomics and nutraceuticals has led to new era of medicine and health (38). This review highlights the concept, classification, sources and health benefits of nutraceuticals in human being (39).

CONCLUSION

With the changing lifestyle of human beings, with age, the levels of the nutrition to resistance mechanism decrease noticeably. This article replicates the possible advantages of nutraceuticals to treat and prevent many health problems. The fundamental principle underlying nutraceuticals is to "mind what you eat and stay healthy". Each category of nutraceutical influences health in a specific way that is unique to that class. Nutraceuticals are used as the preventive measure other than treatment for the multiple aliments because of bad lifestyle and nutritional deficiencies. The ailments like cancer, diabetes mellitus, obesity, cardiovascular diseases, osteoporosis, arthritis, cholesterol, gastrointestinal infection are treated and prevented with the proper intake of nutraceuticals like dietary fibres, probiotics, prebiotics, polyunsaturated fatty acids, antioxidant vitamins, phytochemicals, spices. Today, the growing awareness levels of the people about fitness and health together with a predisposition towards natural materials to prevent and treat acute and chronic ailments increased the focus towards used of neutraceuticals. This review increased the awareness about the use of nutraceuticals as preventive majors and in the treatment of several life-threatening diseases.

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