

# IMPACT OF NUTRACEUTICALS ON HEALTH AND DISEASE PREVENTION: A COMPREHENSIVE REVIEW

**Shivani Sawhney**

Assistant Professor Department of Home science  
Padma Shri Padma Sachdev GCW Gandhi Nagar Jammu

## Abstract

*Nutraceutical is a hybrid of 'nutrition' and 'Pharmaceutical' . Nutraceuticals in broad are food or part of food playing a significant role in modifying and maintaining normal physiological function that maintains healthy human beings. Nutraceuticals and functional foods in the recent years have witnessed a tremendous increase in the interest among the consumers due to their potential of providing health and medical benefits and regulating immunity and thereby preventing as well as treating simple diseases. Thus the sector of nutraceuticals is often envisioned together of the missing blocks within the health advantage of a private . The food products used as nutraceuticals can be classified as traditional and non-traditional . Traditional will be directly obtained from nature like lycopene in tomatoes, omega-3 fatty acids in salmon or saponins in soy etc. Whereas non-traditional are enriched with supplements or genetically modified designed crops to boost the nutrients like minerals added to cereals etc. These nutraceuticals help in combating some of the major health problems of the century such as obesity, cardiovascular diseases, cancer, osteoporosis, arthritis, diabetes, cholesterol etc. In whole nutraceuticals has led to the new era of drugs and health during which the food industry has become a search oriented sector. In present review, an understanding of various nutraceuticals and their role in preventing diseases, has been discussed. Further application of nutraceuticals within the prevention of varied diseases has also been discussed.*

**Keywords:** Nutraceuticals, functional foods, immunity, health, diseases.

## INTRODUCTION:

In recent years, the field of nutrition and health has witnessed a paradigm shift in its approach towards disease prevention and overall well-being. As the prevalence of chronic diseases continues to rise globally, there has been an increasing interest in exploring novel strategies to enhance health and prevent the onset of such conditions. One such avenue of exploration that has gained significant attention is the utilization of nutraceuticals. Nutraceuticals, a portmanteau of "nutrition" and "pharmaceuticals," refer to bioactive compounds derived from natural sources that offer potential health benefits beyond basic nutrition. These compounds have been studied extensively for their roles in mitigating the risk of various diseases and promoting overall health and wellness.

The concept of nutraceuticals is rooted in the age-old wisdom of traditional medicine systems, where natural ingredients have been used for their therapeutic properties. In recent times, the scientific community has begun to unravel the mechanisms underlying the health benefits attributed to these compounds. This has led to a surge in research aimed at understanding the impact of nutraceuticals on various aspects of health and disease prevention.

The rationale for investigating the impact of nutraceuticals on health and disease prevention is multi-faceted. Firstly, the global burden of chronic diseases, such as cardiovascular diseases, diabetes, and certain types of cancers, has prompted a shift towards preventive healthcare strategies. Nutraceuticals, due to their diverse bioactive constituents, offer a promising avenue for developing complementary and alternative approaches to conventional therapies. Secondly, the growing preference for natural and holistic approaches to health has fueled consumer demand for nutraceutical products. As a result, the market for nutraceuticals has expanded significantly, underscoring the need for evidence-based research to guide both consumers and healthcare practitioners.

This review aims to critically examine the current body of literature on the impact of nutraceuticals on health and disease prevention. By synthesizing findings from a diverse array of studies, we intend to provide a comprehensive overview of the potential benefits and limitations associated with the use of nutraceuticals. To achieve this, we will explore the mechanisms of action through which nutraceuticals exert their effects, delve into the clinical evidence supporting their use, and highlight areas that warrant further investigation. Additionally, we will discuss considerations related to safety, regulatory frameworks, and the challenges of translating research findings into practical recommendations.

Throughout this review, we will draw upon a wide range of primary research articles, systematic reviews, and meta-analyses to present a balanced and evidence-based perspective on the subject matter. By critically

analyzing the available literature, we seek to contribute to the understanding of nutraceuticals as a viable approach to health promotion and disease prevention.

In subsequent sections, we will delve into the various classes of nutraceuticals, their potential mechanisms of action, and their specific impacts on different health outcomes. We will also address the global nutraceutical market. Through this comprehensive exploration, we aim to shed light on the evolving role of nutraceuticals in shaping the landscape of modern healthcare.

Nutraceuticals are categorized based on foods available in the market:

- Traditional nutraceuticals
- Non-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 based on:

### 1. Chemical Constituents

#### a) Nutrients

Nutrients are vitamins, minerals, amino acids, and fatty acids with established nutritional functions. Most vegetables, wholegrain cereals, dairy products, fruits, and animal products such as meat, poultry, contain vitamins and help cure heart diseases, stroke, cataracts, osteoporosis, diabetes, and cancer. Minerals found in the plant, animal, and dairy products are useful in osteoporosis, anemia and build strong bones, teeth, muscles, improve nerve impulses and heart rhythm. Flaxseed and salmon contain fatty acids omega-3 PUFAS, and are potent controllers of the of the inflammatory processes, maintenance of brain function, and reduce cholesterol deposition. (Chauhan, 2013) (Nowsu et al., 2020)

#### b) Herbals

Nutraceuticals hold a great promise to improve health and prevent chronic diseases with the help of herbals. Some examples are willow bark (*Salix nigra*), having an active component as salicin, which is anti-inflammatory, analgesic, antipyretic, astringent, and antiarthritic. Parsley (*Petroselinum crispum*) contains flavonoids (apiol, psoralen) and is diuretic, carminative and antipyretic. Peppermint (*Mentha piperita*) contains menthol as an active component and cures a cold and flu. Lavender (*Lavandula angustifolia*) contains tannin which helps cure depression, hypertension, stress, cold, cough, and asthma. Cranberries (*Vaccinium erythrocarpum*) contain proanthocyanidin and are found to be useful in cancer, ulcers, and urinary tract infections. (Ehrlich, 2009)

#### c) Phytochemicals

Phytochemicals are one class of nutraceuticals. They are classified based on the chemical name given according to their phytochemical properties. For example, Carotenoids (Isoprenoids) found in various fruits, vegetables, and egg yolk, are anti-carcinogenic, boost natural killer immune cells, and protect cornea against UV light. Legumes (chickpeas and soybeans), grains, palm oil contain non-carotenoids, which remove cholesterol and are anti-carcinogenic. Flavonoid polyphenolics are found in berries, fruits, vegetables, and legumes, which are potent antioxidants, phytoestrogens, prevent breast cancer, prostate cancer, and control diabetes. Non-flavonoid polyphenolics are present in dark grapes, raisins, berries, peanuts. turmeric roots are strong anti-inflammatory, anti-oxidants, and effective anti-clotting agents and reduce cholesterol. Phenolic acids, found in blueberries, tomatoes, and bell peppers having antioxidant activity, reduce mutagenicity of polycyclic aromatic hydrocarbons. Seeds of *Barbarea verna*, broccoli contain isothiocyanates (glucosinolates) and have antitumorogenic activity (Zhao, 2007).

### 2. Probiotic Microorganisms

Living microorganisms when consumed in adequate amounts, confers the health of an individual. They are a friendly bacterium that enhances healthy digestion and absorption of food or some specific nutrients. Probiotic products are easily available in the market as food supplement. Some sources are- Milk (*L. lactis*), Yoghurt (*S. thermophilus*), and gastrointestinal tract (*L. johnsonii*).

The scientific interest in probiotics boosted from the work of Metchnikoff 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. (Michail et al., 2006) 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. Probiotics can cure lactose intolerance by the production of the specific enzyme ( $\beta$ -galactosidase) that can hydrolyze the offending lactose into its component sugars. (Bharti et al., 2020) Sources of probiotic microorganisms are mentioned (Table 1).

**Table 1: Sources of probiotic microorganisms**

Milk	Yogurt	Fermented products	Human breast milk	GI tract	Vegetables/ grains/ fruits
Lactobacillus acidophilus L. lactis	L.delbrueckii subp bulgaricus	L.cellobiosus L.curvatus L.casei L.fermentum. L.helviticus L. farciminis	L.reuteri L.salivarius	L.gassert L. johnsoni	L.brevis L. plantarum
	Bifido bacterium adolescentis	B.thermophilum B. animalis	B.infantis B.longum B.breve, B. lactis		
Propioni bacterium freudenreichli	Streptococcus thermophilus			Escherichia coli Nissle 1917	Leuconstoc mesenteroides
					S. cerevisiae, S. boulardii Mushrooms

### 3.Nutraceutical Enzymes

Enzymes are an essential part of life, without which our bodies would cease to function. Those people who are suffering from medical conditions such as hypoglycemia, blood sugar disorders, digestive problems, and obesity, eliminate the symptoms by enzyme supplements to their diet. The application of enzymes in different food products impart specialized characters that increase their nutritive value and sensory qualities. Enzymes are extensively used in the baking industry, dairy, juice industry, wine and brewery, and for cereal production. The treatment of cereals with enzymes results in the increase in the amount of soluble dietary fiber, water-soluble antioxidant activity and phenolic compound bioavailability (Lee and Talcott,2004). Pectinases are enzymes are used to stabilise the cloudiness in fruit juices and clarify them. The application of these enzymes in fruit juice processing results in the formation of polyphenolic compounds (Kim et al.,1990) Protein fortification of fruit juices is achieved by the addition of soy protein hydrolysates which is initially treated with proteases, such as trypsin and alcalase, which renders the digests soluble in water based solutions (Bautista,2005). In wine production, pectinases find applicability in improving stability, color extraction and increasing the anthocyanin content in red wine (Nilsson,1988)

**Table 2: List of nutraceutical enzymes from microbes, plants, and animals**

Microbial Enzymes/source	Plant Enzymes/source	Animal Enzymes/source
Hemicellulase (microorganisms and mushrooms)	Hemicellulase (plant walls)	OxBile (ox)
Catalase	Pectinase (cell wall)	Pancrelipase (pancreatic juice)
Amyloglucosidase (ascomycetes)	$\alpha$ -Galactosidase (beans, cabbage, Brussels sprouts, broccoli, asparagus, other vegetables, and whole grains)	Trypsin (pancreatic juice)
Glucoamylase (A. niger, Saccharomycopsis fibuligera)	$\beta$ -Amylase (higher plants)	Chymotrypsin (all classes of vertebrates)
Cellulase (all living cells)	Bromelain (pineapple)	Pepsin (animals tracheal secretions)

Invertase-Sucrase (yeast)	Biodiastase (soybean)	Lysozyme (saliva, tears, egg white, and many animal fluids)
Lactase-β-Galactosidase (bacteria)	Glucoamylase (callus and suspension cultures of sugar beets ( <i>Beta vulgaris</i> L.) as well as in mature roots)	α-Amylase (saliva)

### 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
- b) Recombinant nutraceuticals

#### 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, Prebiotic and probiotic fortified milk with *Bifidobacterium lactis* HN019 used in diarrhea, respiratory infections, and severe illnesses, in children. Banana fortified using soybean ferritin gene in iron deficiency (Sazawal et al., 2013)

#### 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 (Table 4) and the extraction of bioactive components by enzyme/fermentation technologies as well as genetic engineering technology are achieved through biotechnology.

Recombinant nutraceuticals are foods that are produced by both genetic recombination and biotechnology (Singh and Sinha, 2012) is type of foods and crops are genetically modified to develop products that contain recombinant compounds and proteins that would be make them more beneficial to health. ( Drake et al., 2017). Iron rice, golden rice, maize, golden mustard, multivitamin corn, and gold kiwifruit are examples of these nutraceuticals. Gold kiwifruit contains a recombinant gene that increases ascorbic acid levels, carotenoid, and lutein to enhance immune function. Additionally, it is considered a source of vitamins, potassium and fiber (Alamgir, 2017)

**Table 3**

Source	Enzyme	Products
<i>Acetobacter xylinum</i>	B-glucuronidase	Kombucha beverage
<i>Escherichia coli</i> K-12	Chymosin	Milk-coagulated products
<i>Fusarium venenatum</i>	Xylanase	Increased bran solubilization
<i>Aspergillus oryzae</i>	Esterase-lipase, Aspartic proteinase, Glucose oxidase, Laccase, Lipase, Pectin esterase,	Alcoholic beverages (Sake, koji)
<i>Saccharomyces cerevisiae</i>	Stilbene synthase and 4 coumaroyl-CoA	Resveratrol
<i>Spirulina Pacifica</i>	Indoleamine 2,3-dioxygenase (IDO)	Increased hemoglobin

**Table 4: Product produced by recombinant plants**

Source	Enzyme	Products
Gold kiwifruit	Iron	High level of Ascorbic acid, carotenoids lutein, and zeaxanthin
Potatoes	Protein	Tuber-specific expression of a seed protein, AmA1 (Amaranth Albumin 1)

Vitamin A		Soybean ferritin gene
Multivitamin corn	Multivitamin	Vitamins $\beta$ -carotene corn ( <i>Zea mays</i> ) phytoene synthase (psyl) cDNA), ascorbate (rice dehydroascorbate reductase (dhar) cDNA), and folate ( <i>E. coli</i> folE gene encoding GTP cyclohydrolase (GCHI)
Maize	Vitamin A (retinol)	Bacterial genes crtB and crtI
Tomato	Folate	
Golden rice	Vitamin A (retinol)	Two daffodil genes bacterial gene
Iron rice	Iron deficiency	Soybean ferritin gene

**Table 5: Product produced by recombinant animals.**

Source	Enzyme	Products
Fermented soya milk	Calcium deficiency	Lactobacillus acidophilus American Type Culture Collection (ATCC) 4962
Cattle	Human lysozyme	rHLZ expression vector pBC2 HLY-NEOR
Yogurt	Probiotics microorganism	Bifidobacterium lactis Bb-12 and Lactobacillus acidophilus LA-5
Cows	Lactoferrin deficiency	Recombinant human lactoferri

### Nutraceuticals in disease prevention

Nutraceuticals provide protection against non communicable diseases, nutraceuticals play an important role in preventing different disease onset and minimize complication of the disease. It provides protection against non communicable diseases, delay ageing process, increases life expectancy and improves function of the body.

#### Diabetes

Nutraceuticals are non-specific biological therapies botanicals, vitamins, antioxidants, minerals, amino acids and fatty acids which are used to promote wellness, prevent malignant processes and control symptoms. Several nutraceuticals used in clinical practice have been shown to target the pathogenesis of diabetes mellitus, metabolic syndrome and their complications and to favourably modulate a number of biochemical and clinical endpoints. Hypo glycemc drugs are widely used in several traditional systems of medicine to prevent diabetes mellitus. (Vrish,2018). It has been found that the citrus fruits has potential benefits in the management of diabetes.

It has been found that people whose fasting levels of blood glucose and triglycerides has been unchanged by glibenclamide experienced a 40% drop in blood sugar and a 52% drop in triglycerides after treatment with aloe vera juice. (Bunyapraphatsara, et al., 1996). Co-administration of synthetic herbal and nutraceuticals, that is polypathy along with non-pharmacological approaches may be the most suitable solution for holistic treatment of diabetes.

#### Obesity

Nutraceuticals exhibit several health benefits and in the management of obesity and its related comorbidities (Nijhawan and Behl,2020). It has been found that nutraceuticals able to positively modulate the activity of adipocyte cell lines and further positive effects have been found in other aspects of pathogenic obesity. While their ability to affect weight loss is still controversial, it is clear that they have a great potential to reverse the development of overweight and obesity related comorbidities (Conroy,2011). Nutraceuticals like conjugated linoleic acid (CLA), capsaicin, Momordica Charantia (MC) and Psyllium fibre are considered to play a great role in combating obesity (Kasbia,2005). Probiotics and nutraceuticals led to a significantly lower prevalence of

obesity, reduction of insulin resistance, total and VAT weight. Supplementation of probiotics with omega 3 may have the most beneficial anti- obesity properties (Kobyliak,2018).

### Cardio- vascular disease

CVD ranks among the most common health- related and economic issues worldwide. Several foods and dietary supplements have been shown to protect against the development of CVD. Usage of nutraceuticals may have the potential to increase the effectiveness of therapy (as well as to reduce the residual risk). Fibre , mainly the soluble /viscous type, seems to have beneficial effects on different CV risk factors even if the entity to these effects is not very high. LDL- cholesterol levels are beneficially influenced by phyto sterol, red yeast rice and berberine, which seems to act positively also on blood glucose levels, plasma triglycerides, HDL- cholesterol and blood pressure (Rivellese, 2019). Several types of nutraceuticals, including sour tea, cocoa, common spices, vitamin C, vitamin E, lycopene, flavonoids, coenzyme Q 10, milk's tripeptides, calcium, magnesium, poly unsaturated fatty acids, and prebiotics in preventing and treating hypertension (Ghaffari and Roshanravan,2020). Antioxidants can prevent and treat hypertension. Whole food and phytonutrient concentrates of fruits, vegetables and fibre with natural combinations of balanced phytochemicals nutrients, antioxidants, vitamins, minerals and appropriate macro-nutrients and micro-nutrients are generally superior to single component or isolated artificial or single component natural substances for the prevention and treatment of hypertension and CVD (Houston,2010).

### Cancer

Cancer is a chronic disease of the genome that is influenced by nutritional factors at many stages of carcinogenesis, promotion and progression. Current cancer treatments, such as chemotherapy, radiotherapy and surgery, induce unintended side effects compromising also health and well being of patients. Studies suggest that some plant based agents may impact cellular and molecular processes underlying tumor progression. However, some of these molecules might also play an antagonist activity against classic therapeutic agents.(Ranzato,2014)

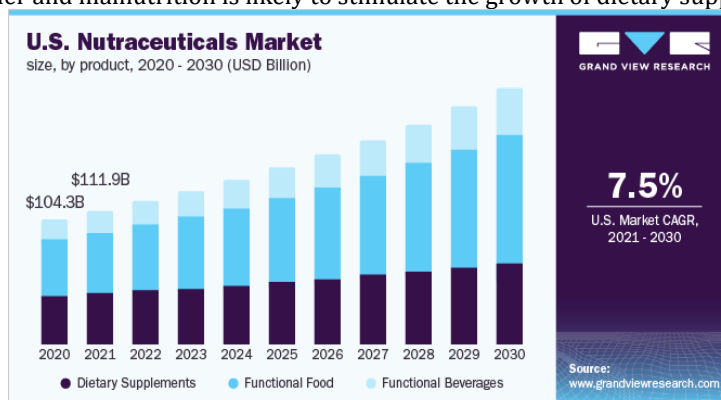
**Combined Therapy : A New Promise** – To achieve high efficacy and low toxicity in cancer therapy, selecting therapeutical agents is a critical step in designing strategy. In recent years, some dietary agents, recognized as anti cancer agents, acquired more importance in combined therapy. These agents can exert anti cancer activities through regulation of different cell signaling pathways. Importantly, these nutraceuticals are non toxic and therefore conventional cancer therapies combined with this nutraceuticals may exert enhanced anti-cancer activity through synergistic action .(Sarkar & Li, 2006). Thus , the combination treatment may also decrease the systemic toxicity caused by chemotherapy or radio therapy because lower dose of chemotherapeutic agents could be used when combined with nutraceuticals when combined with nutraceuticals where by toxicity could be minimized.

### Osteoporosis:

Osteoporosis is a common disorder observed particularly in aging population and post menopausal women. It has been found that nutraceuticals identified from dietary agents such as butein, cardamonin, coronarin D, curcumin, diosgenin, embelin, gambogic acid, genstein, plumbagin, quercetin, reseravatrol, zerumbone and more, can modulate cell signaling pathways and reverse or slow down osteoporosis. Although scientific studies provide evidences of therapeutic efficacy of nutraceuticals, in depth clinical investigation is need of the hour for its safe consumption by osteoporotic population (Rajput,2018).

### Global Nutraceuticals Market

The global nutraceuticals market size was valued at USD 454.55 billion in 2021 and is expected to expand at a compound annual growth rate (CAGR) of 9.0% from 2021 to 2030. The growing demand for dietary supplements and functional food is expected to be a key driving factor for the market over the forecast period. A favorable outlook towards medical nutrition in light of the increasing application for the treatment of cardiovascular disorder and malnutrition is likely to stimulate the growth of dietary supplements.

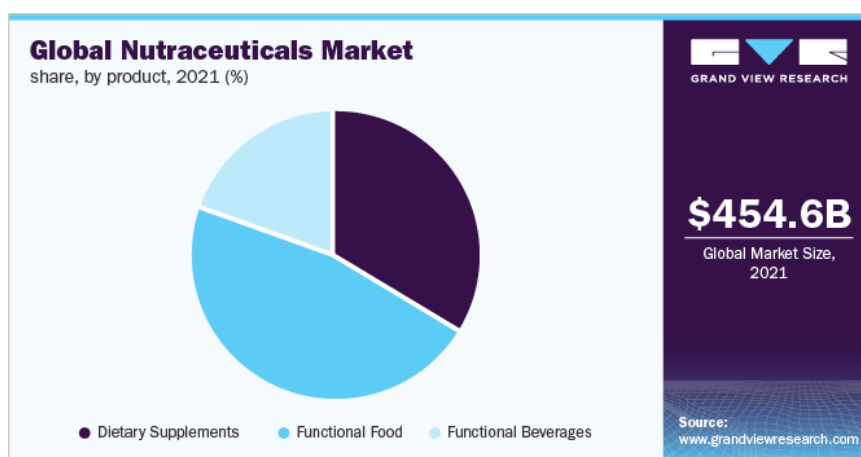


The global nutraceuticals market is expected to witness consistent growth following the outbreak of COVID-19, as these include the food ingredients that provide medical or health benefits to prevent diseases as well as boosts the overall immune system. The flexibility in storage options, the demand for combined formulations with multiple benefits, increased consumer education levels, informed consumers, and the rise in health concerns among connected consumers during this period of pandemic increased the demand for nutraceutical products around the globe.

The rising demand for nutraceuticals with medical benefits is one of the major factors driving the nutraceuticals market growth. They contain antioxidants, probiotics, and polyunsaturated fatty acids, which help in managing health issues, like obesity, Cardiovascular disease, cancer, cholesterol, arthritis, and diabetes.

### Product insight

The functional food segment led the overall market in 2021 with a revenue share of over 40.0%, followed by dietary supplements and functional beverages. Technological upgradation, coupled with progression in product development, is projected to drive the dietary supplements industry over the coming years. Sports drinks are gaining popularity among athletes and other individuals involved in energetic physical activities. The millennial generation exponentially drives the sports drinks market due to its high buying capacity, willingness to pay for health products, acute interest in sports, and growing inclination toward fitness activities.



### Increased Demand For Healthy & Functional Foods

In the functional food segment, the prebiotics and probiotics segment is anticipated to register the highest growth rate of 11.4% from 2021 to 2030. This can be attributed to the rising demand for diet food and shifting preference toward weight management solutions. The prebiotics and probiotics segment is anticipated to grow owing to its promising role in supporting the immune system and acting as major preventive health supplements during the COVID-19 pandemic.

### Regional Insights

Asia Pacific accounted for the largest revenue share of over 30.0% in 2021. The growing health concerns amongst consumers and increasing awareness regarding nutraceuticals are likely to be the major drivers of the APAC market. Additionally, an increase in the aging population, spending patterns on healthcare products, and changing lifestyles have enhanced the growth of the nutraceutical industry in Asia Pacific. Vast product portfolio and government regulations regarding nutraceutical products are a few factors that suppress this market. However, the growing trend of food fortification with nutraceutical products is anticipated to create a significant growth opportunity for this market.

Rising awareness regarding nutritional enrichment in China and India is expected to remain a favorable factor for market growth. Furthermore, the expansion in the retail sector in emerging markets including China, Indonesia, Malaysia, and India in light of regulatory support to promote investments is expected to increase the accessibility to buyers over the forecast period.

Varying lifestyles along with rapid urbanization have also led to consumers' inclination towards healthy diet options. Vitamins are considered to be vital for the proper functioning of the human body and they help in the prevention of various diseases and wound healing. On the back of these factors, the Asia Pacific region is anticipated to witness significant growth from 2021 to 2030

### Key Companies & Market Share Insights

Some prominent players in the global nutraceuticals market include:

- Cargill, Incorporated

- Archer Daniels Midland Company
- DuPont
- Nestle S.A.
- Danone
- Royal DSM N.V.
- General Mills
- Innophos
- WR Grace
- Amway Corporation
- AOR Canada
- Arkopharma Laboratories S.A.
- Bactolac Pharmaceuticals, Inc.
- E.I.D Parry Ltd.
- Valensa International
- Matsun Nutrition
- Mead Johnson Nutrition Company
- Natrol Inc.
- The Hain Celestial Group, Inc.
- Herbalife Ltd.

Rising consumer interest in functional food is a result of the health benefits, performance, and perceived wellness. Owing to the ease of incorporating nutraceutical ingredients in it, the demand for functional end-products such as dairy products, bakery and confectionery, snacks, cereals, fats and oils, meat, and baby food is on the high rise. Popular fortification includes vitamins, minerals, fiber, and protein. Currently, high-protein food is the real winner, as it became popular among fitness enthusiasts. Also, people, these days are even more concerned about their health than their baby boomer counterparts.

For companies to differentiate themselves from the competition and create space in a crowded market, they are changing their delivery systems. It has evolved beyond tablets and capsules to include newer modes of delivery, including soft chews, chewing gum, gummy bears, patches, lollipops, and quick-dissolving strips. Fortified products are offered in convenient single-serving sizes. This is the reason behind the huge demand for functional snack bars. Furthermore, nowadays, the dietary supplement has moved into more 'food-like' delivery forms, such as pudding-like squeeze packets for omega 3 fish oil, joint juice for glucosamine, and calcium in chocolate chew, etc. Rising awareness regarding calorie reduction and weight loss in countries, including U.S., China, and India, is expected to promote the application of nutraceuticals, which, in turn, will have a substantial impact on the industry growth.

Demand for nutraceuticals is increasing at the global level as it improve the digestive and immune systems and enhances the cognitive behavior of consumers.

Growing trend among consumers to alter dietary habits is likely to boost the demand for nutraceuticals. The consumer belief that improper diet results in an increase in costs on pharmaceuticals are anticipated to boost the demand for nutraceuticals. This would also help the government as it would result in lesser expenditure on healthcare and low social security costs.

Rise in disposable income, increasing consumer awareness concerning health issues, and rapid urbanization are likely to boost the nutraceutical market growth over the forecast years. Positive outlook towards medical nutrition owing to increasing weight management programs, along with cardiovascular diseases, is anticipated to propel the demand for nutraceuticals.

The rise and evolution of wellness-focused diets, such as keto and paleo, are driving food producers to cater their products in this direction. Functional food products, such as probiotics and omega-3, are highly used in yogurt and fish oils in order to reduce the risk of cardiovascular diseases and develop the quality of intestinal microflora, which is further projected to fuel the market growth of the nutraceutical products over the coming years.

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