



COMPREHENSIVE REVIEW ON NUTRACEUTICALS

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ABSTRACT

Nutraceuticals are products having nutritional and therapeutic values. Nutraceutical may be defined as substance that considers a food or fraction of a food that gives therapeutic or health advantages, around avoidance and management of disease. It is a diet appendage which carries a strenuous appearance of recognized bioactive agents from food. It used to enhance health in dosages. It is solid preparation. The mindset of people now is precaution is always better than cure. They are received significant attention because of its potent nutritional values, therapeutic action and safety. Nutraceutical market of India increased day by day. Some studies shows that complications in standardization, awareness, price, marketing and distribution of nutraceuticals. In the current review significant concept along new strategies about nutraceutical studied regard to its disease modifying indications. For this currently available papers regarding special side of nutraceuticals as choice for pharmaceuticals were reviewed by scientific websites like Pub Med, Google Scholar, and Medline.

Keywords: Nutraceuticals; Dietary supplements; Disease modifiers; Regulation of nutraceuticals

INTRODUCTION

The phrase nutraceutical first used by Stephen De Felice; it is a combination of two worlds ‘nutrition’ and ‘pharmaceutical’ [1]. It is a material that could be considered a food or ingredient of a food that gives therapeutic or health advantages, encompassing avoidance and management of disease [2]. It is a diet appendage with the aim of carrying a strong type of a recognized biologically active agent from a foodstuff, obtainable in a non-food medium. It is used to enhance physical condition in dosages that beat those that could be gained from ordinary food. It is solid preparation. Food and drug administration (FDA) controls nutritional boost beneath a various set of rules than those covering conservative foodstuff and drug products. There is not a precise guideline available in Europe to govern nutraceuticals [3].

Classification

Nutraceuticals are indifferent biological therapy for support health, avoid spiteful processes and manage symptoms [4]. Depending on different characteristics, nutraceuticals are classified by several methods [5].

1. Nutraceuticals according to food source.

2. Nutraceuticals according to their action of mechanism.
3. Nutraceuticals according to their chemical nature.
4. Nutraceuticals according to their higher contents in specific food items.

Nutraceuticals according to food source

These nutraceuticals obtained from plants, animals and microbial sources. Some nutraceuticals are obtained from all three sources. For example, linolenic acid obtained from animal flesh and synthesized in plant also. Phosphatidyl choline and choline obtained from all three sources.

Nutraceuticals according to their action of mechanism

These nutraceuticals categorized by mechanism of action of drug (Table 2).

Nutraceuticals according to their chemical nature

These nutraceuticals categorized by chemical nature of compound. Some primary, secondary metabolites, vitamins are included in this category (Table 3).

Nutraceuticals according to their higher contents in specific food items

Specific food contains rich source of active constituents (Table 4).

Table 1: Nutraceuticals according to food source

Plants	Animals	Microbial
Ascorbic acid, Cellulose, Pectin, Allicin, Catechin, Capsaicinoids	Conjugated linolenic acid, Lecithene, Spingolipids	Yeast

Table 2: Nutraceuticals according to their action of mechanism

Antioxidants	Anticancer	Anti-inflammatory	Bone protective
β -carotene, Tocopherols, lycopene, Ellagic acid	Genestein, Glycyrrhizin, Daidzein, α -tocopherol	Curcumin, Quercetin, Capsaicin, lenolenic acid	Soy-protein Genestein Daidzein Calcium

Table 3: Nutraceuticals according to their chemical nature

Minerals	Microbial	Protein based	Phenolic compound
Calcium Zinc Selenium Potassium	Prebiotics Probiotics	Indoles Folate Amino acids Cyanates	Tannins Isoflavones Flavonols Coumarins

Table 4: Nutraceuticals according to their higher contents in specific food items

Nutraceuticals	Name of specific food
Catechin	Tea, berries
Curcumin	Turmeric
Isoflavones	Soyabean, legumes
β -carotene	Carrots, pumpkins

Scenario of nutraceutical in India

The Indian nutraceutical commerce has an enormous scenario, wide variety of products available, giving an approach to the remarkable expansion. Nowadays India is largest market for nutraceuticals because in approximately each segment has need for some form of nutraceuticals. Growing kids required functional food and supplement proper development. Younger's required nutraceuticals for active lifestyle. Pregnant and lactating mothers necessitate complementing their nutrition need. Unhealthy eating habits and sitting lifestyle led to rising health issues; this contributes suitable market environment for the nutraceutical industry in India. The value of the international nutraceutical industry is US\$ 182.6 billion in 2015, which may be the fastest increasing business and probable to increase at a CAGR of 7.3% since 2015 to 2021. Current information showed that

the nutraceuticals business in India is value about \$ 2.2 billion with predictable to rise at 20% to \$ 6.1 billion by 2019-2020. Major role-playing industries in India is Piramal, Himalaya herbal Healthcare, Amway, Pfizer, Amul, Sami Labs, Elder pharmaceuticals, EID Parry's, Zandu Pharmaceuticals, Dabur India, GlaxoSmithKline consumer healthcare, Cadila Health care, and Ranbaxy [6]. As comparison to pharmaceuticals, they have significant pharmacological properties with negligible to no side effect [7].

Broad regulatory scenario for nutraceuticals

National Academy Institute of Medicine and National Research Council developed a Blue Ribbon in 2005 organization with the aim of give an outline for the Federal Food and Drug Administration to estimate nutritional adjunct, exclusive of characteristic

nutraceuticals as individual items. Pharmaceuticals and nutrients cure and prevent disease but only pharmaceuticals have government sanction. The principal set of regulations overriding the individual nutraceutical marketplace is the Dietary Supplement Health and Education Act (DSHEA), 1994.

According to DSHEA, FDA has no permission to believe innovative manufactured goods as medicine or food additives, if it comes in the nutritional supplement. Nutraceuticals used for animals not under the regulation of Dietary Supplement Health and Education Act. Good Manufacturing Practice guideline (21 CFR, Part 111) established in 2007, whereas Good Manufacturing Practice enforcement was the liability of the FDA and the Department of Health and Human Services [8, 9].

Indian law and regulation not attribute some precise authorized condition to nutraceuticals. The government of India recognized the Food Safety and Standards Act (FSSA) in 2006 to establish a law and regulation system. FSSA not segregate useful foods, nutraceuticals, and nutritional supplements; as an alternative, every food is recommended as food-stuff meant for an extraordinary dietary purpose. Indian government observed the World Trade Organization summarize instruction for nutraceuticals and foods for distinctive

diets and therapeutic purposes. Outline established on element, labeling, foreign matter, additives, strength and dietary claims. The outline of law contains the metrics for the production and trade of these classes of foods and suggested amount or utilization degree. Japan is the earliest country to countenance the problem of amendable food supplements and foodstuff by providing the foods for specified health use (FOSHU) base on a liberal demand commencing shareholder for approval [10, 13].

Aspect of nutraceutical formulation

Formulation of nutraceutical formulation is easy as like pharmaceutical dosage form but quite challenging to gain significant bioavailability. The bioavailability affect by stability, low solubility, permeability in gastrointestinal tract. Example of this is curcumin. Curcumin has very low oral bioavailability due to very low serum level, partial tissue distribution, rapid metabolism and short half life [14, 15]. Ingredient used in probiotics encapsulation technique is chitosan, alginate, Carrageenan, starch, whey proteins and locust bean gum. In probiotics encapsulation technology required to retain cell viability like choice of biomaterial, solvent and toxicity, and choice of proper technology are of paramount concern in formulating

probiotics [16, 17]. Novel nanotechnology opened a new avenue for increase solubility and enhancement of bioavailability [18]. The generic markets growing worldwide so

price of nutraceuticals is in limit so middle class people also able to bring it. Some top nutraceuticals available in market are listed in Table 5.

Table 5: Some top used nutraceuticals in market

	Marketed products
Liquid Prenatal Vitamins Cholecalciferol or Vitamin D3	Prenatal +, DHA Omega-3 , Vitabiotics Pregnacare Liquid HK Vitals Vitamin D3, Pure Foods – Vitamin D3 2000 IU, Vitamin D3 Granules
Garcinia Cambogia	Bhargava Garcinia Cambogia Tablet, Garcinia Cambogia Extract Garcinia Cambogia Pure Extract 500 mg Capsules
Raspberry Ketones	INLIFE Keto Slimming Vegetarian Capsule 90's, Vokin Biotech Raspberry Ketone Pro capsules, Himalayan Organics Raspberry Ketones Plus Veg Capsules
Vitamin B12	Meg-B12 Capsule, Geofresh Natural Plant Based & Organic Vitamin B12 Veg Capsule, GNC Vitamin B-12 1000 mcg - Timed-Release - 90 Vegetarian Caplets
Alpha-lipoic Acid	Himalayan Organics Alpha Lipoic 300mg, Herbalife Cell Activator-antioxidant Alpha Lipoic Acid Tablets, Herbs of Gold Alpha Lipoic 300 60 Caps
Probiotics	Wow Probiotics 20 Billion CFU (14 Probiotic Strains) 500 mg, NOW Foods Probiotic-10 25 Billion - 50 VCaps, Probiotics 25 Billion CFU Formula 500mg - 60 Capsules
Omega 3 Fatty Acids	Herbalifeline with Omega 3 Fatty Acids EPA DHA 60 Softgles, Osmega 300mg Capsule, Nirvasa Salmon Fish Oil Capsules 1000mg – 60 Capsules
Chyawanprash Appetite intercept Amiriprash	Dabur Chyawanprash, Amway chyawanprash, Zandu Chyawanprash Natrol Garcinia Cambogia Extract Appetite Intercept 120 Capsules, Garcinia Cambogia pills Amiriprash GOLD, Virgo Amirikalp Gold Chyawanprash 500g
Green Tea Supplements	Nutrigrow Green Tea Capsule, Healthyhey Nutrition Egcg From Green Tea Extract - 500mg Egcg, Polymerz Tablet With Green Tea Extract
Echinacea	Allen Nutraceutical Echinacea Immunity 400mg Capsule, ECHINACEA PURPUREA CH, Echinacea 450 mg for Immune Health to Support Immune System 60 Veg. Capsules

Nutraceuticals has disease modifying capacity. Some herbal nutraceuticals effective on remedial disorders associated with oxidative stress. This may include cardiovascular, tumor, hypersensitivity, alzheimer, diabetes, eye, immune, inflammatory, obesity and Parkinson's diseases [19]. In prevention and control of cardiovascular diseases along with physical exercise some nutraceuticals in form of minerals, vitamins, omega-3 fatty acids, dietary fibers, and antioxidants are recommended [20, 21]. Flavonoids containing food may reduce the risk of death of elderly cardiac patients [22]. Cancer is major problem faced by

nowadays in worldwide. According to WHO report cancer patient's increases and 10-15 million current cases in year 2020 that increases 50%. Healthy diet and changing in lifestyle helps in prevention of cancer [23]. Carotenoids help to reduce oxidative stress and harm to DNA [24]. Lycopene is most important carotenoids present in guava, tomatoes, pink grapefruits, water melon and papaya [25].

Alpha carotene and beta carotene possess antioxidant property that is responsible for prevention of cancer and other diseased conditions [26]. Globally faced other issue is obesity. Obesity causes various complications and risk [27].

Reasons for obesity is high-fat, energy-dense food, sitting job nature and lack of physical activity. Utilize of nutraceuticals increased for avoidance and management of obesity. Nutraceuticals like *Momordica charantia* and *Psyllium* fiber, capsaicin conjugated linoleic acid own potential antiobese properties [28]. Omega 3- fatty acids decrease glucose tolerance of diabetes patients [29, 30]. Morphine and garlic stimulate and suppress immune system [31]. Quercetin prevents low density lipoproteins from damage of blood vessels. Quercetin decreases oxidative stress in diabetic patients [32]. Flavonoids containing nutraceuticals used for the treatment of rheumatoid arthritis [33].

Due to pandemic of Covid-19 world faces calamity in public health. Most of COVID-19 patients suffer from direct or indirect injury to liver. The drug-induced liver damage should not be unnoticed throughout corona virus infectivity management and should be cautiously studied. Eventually, it is essential to discover other methods for hepatoprotection. Some plant based medicines reduces the load of disease. The potential effectiveness of bioactive nutraceuticals should be explored in COVID-19 patients [34]. Nutritional supply plays an important role in the treatment of hospitalized COVID-19 patients [35]. Zinc, Vitamin C and D may be efficient way of

ensuring their enough intakes to sustain best possible immune function, which may also express valuable effects against viral infections due to their immunomodulatory effects [36]. Folic acid and its analogs such as tetrahydrofolic acid and 5-methyl tetrahydrofolic acid used against COVID-19 management [37].

Future Perspectives

For prophylactic and therapeutic purpose are rapidly promising trade is nutraceuticals. It affects globally on the cost of health care so for manufacturing and marketing some rules and regulations required. Manufacturing companies now well known about benefits and healthcare perspective of nutraceuticals. Recently available rules and regulations are suitable but there is at all times potential for modification and updating, maintenance in vision the frequently varying circumstances. Medical care is supposed to be the prefecture of drugs where as nutrition is supposed to be a product of a healthy living. It is estimated that nutraceuticals and pharmaceuticals work together and complement one another. Intensifying the systematic study that validates the efficiency and safety of these innovative formulations will stimulate further investment in the knowledge and purpose. Newly developed techniques such as nutrigenomics, imaging technique used in nutraceuticals research. Their enormous

potential will improve the expansion of foods for targeted group of population by defined risk factors or diseases. The amplified customer consciousness of functional foods and nutraceuticals will still make further profits growth, worldwide [38].

CONCLUSION

From the above review study our team outlook is nutraceutical market increased day-by-day. Not only framework of rules and regulation but also strong implementation is required and inspection of implementation is regulated by governing body. Before marketing in vivo clinical trials will take and check the safety and efficacy of nutraceuticals. Customers and patients take nutraceuticals as drugs. Hence doctors, healthcare professionals and pharmacist also should take into account during regulation and counseling. Before prescribing nutraceuticals the counsel and inform the deviations of result experienced different in different individuals.

Authors' Contribution

SR designed concept and edited, SSB and SL prepared draft, VJ and SSS collect data and analyze data.

Conflict of interest

No conflicts of interest regarding this study.

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