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REVIEW ARTICLE**Nutraceuticals: A Review on current status**

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ABSTRACT:

Nutraceuticals refers to foods having a medicinal effect on health of human beings. It consist of food supplements, herbal products, probiotics and prebiotics, medical foods meant for prevention and treatment of diseases. Major nutraceuticals posses multiple therapeutic effect with lacking of unwanted effects hence attract more consumer interest. Increase in shift towards preventive therapies and increasing disposable income, favorable pricing environment growth in pharma retail chain and increase in healthcare spending is mainly responsible for increasing market for nutraceuticals in India, but lack of standardization and awareness, high pricing, marketing and distribution are some challenges. Nutraceutical market is seeing tidal growth mainly in United States, India and European countries. Faster access to this market is possible through business partnership models, effective regulatory compliance and by evaluating key trends and consumer reference.

KEYWORDS: Nutraceuticals, Prebiotics, Probiotics, Regulatory compliance.

INTRODUCTION:

A nutraceuticals word is comprises of 'Nutrient' and 'Pharmaceuticals'. 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 disease⁶. 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 diseases².

Nutraceutical functional food market in United States is 250 billion US\$ while drug market is 150 billion US\$. Each year about 1000 new products coming in market, and about 29,000 dietary supplements available in US.

Table 1: Fortified foods with their Ayurvedic nutraceuticals

Fortified Foods	Ayurvedic Nutraceuticals
Calcium enriched edli	Antioxidants and bone density enhancer
Probiotic fortified yogurt	Curcumin
Buttermilk	Green tea extract
Omega-3-fortified health drinks and baby foods	Fish oil, Brahmi, Senna, Lutein
Dal and Atta noodles	Sugar free ayurvedic supplement
	Low calorie sweeteners

Global market for nutraceutical vitamin ingredients will increase 6 percent annually to over \$13 billion in 2014. Due to imbalance and deficiencies in national medical delivery system, it keeps large number of population dependent on natural and alternative medicines in India. Popularity of Indian Ayurvedic therapies boost the export opportunities for formulations based on ashwagandha, haldi, ginger, tulsi etc. Vitamin D will see the fastest growth in demand due to increasing clinical evidence of swine flu, cancer, and other preventive medicine benefits. Global demand for herbal and non-herbal extracts is increasing continuously. Green tea for weight loss and cancer treatment, while *Ginkgo biloba* for improving cognitive function, has been widely used as nutraceuticals. Glucosamine generate strongest growth in demand due to its usefulness on treatment of Arthritis. The nutraceutical industry in the US is about \$ 86 billion. This figure is slightly higher in Europe and, in Japan, represents approximately a quarter of their \$6 billion total annual food sales – 47 % of the Japanese population consumes nutraceuticals¹¹.

NUTRACEUTICAL CATEGORIES:**Dietary Supplements including botanicals:**

- Vitamins, minerals, co-enzyme Q, carnitine
- Gingsing, Ginkgo Biloba, Saint John's Wort, Saw Palmetto

Functional Foods:

A food product that is part of usual diet but has beneficial effects that go beyond the traditional nutritional effects¹¹.

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Examples:

- Yogurts - Probiotics for intestinal health.
- Foods/cereals/snacks enriched with soluble fibres, vitamins and minerals.
- Omega-3 milk in prevention of heart disease
- Canola oil with lowered triglycerides for cholesterol reduction
- Oats, bran, psyllium and lignin's for heart disease and colon cancer
- Prebiotics - oligofructose for control of intestinal flora
- Stanols (Benecol) in reduction of cholesterol adsorption

Medicinal Foods:

- Health bars with added medications
- Transgenic cows and lacto-ferrin for immune enhancement
- Transgenic plants for oral vaccination against infectious diseases¹¹

Table 2: Nutraceutical ingredients with their therapeutic applications

Nutraceutical Ingredients	Therapeutic Applications
Probiotics, Prebiotics	Bone and Joint Health
Vitamins, Antioxidants	Cancer Risk Reduction
Soya based ingredients	Cardiovascular Health
Minerals	Maternal and Infant Health
Nutritional lipids and oil	Immune system
Fibers and carbohydrates	Energy and Eye Health
Dairy base ingredients	Skin Health, Respiratory Health
	Weight Management
	Cognitive and Mental function
	Cholesterol Reduction

World demand for nutraceutical ingredients will expand about 7 percent annually to \$29 billion in 2014, serving a \$236 billion global nutritional product industry¹⁵. The United State will continue to be the largest global consumer of nutritional ingredients through 2013 due to the broad increasing range of such products manufactured domestically. China will remain largest worldwide producer of nutraceutical based on its extensive fine chemicals industry and aggressive pursuit of export opportunities. China will also pass the United State as leading consumer of nutraceutical ingredients after 2013¹⁵.

WHO estimates that 60 % of the cardiac patients in the world will be Indians by 2030. Asia is expected to have 190 million diabetes cases, more than half of them are in India and China¹⁵. Scientists say that the percentage of overweight/ obese people in India is on track to rise from 9% in 1995 to 24% in 2025. In addition, use of nutraceutical products is increasing continuously because of some alarming facts as discussed below:

ALARMING FACTS ABOUT INDIA^{9,13}:

- Walking decreased by 60 %.
- Exercise and jogging decreased by 50 %.
- Game and sports are recreational activities decreased by 50%.

- Low activity entertainment such as computer, DVD use has grone up.
- Desk job increased by 80%.

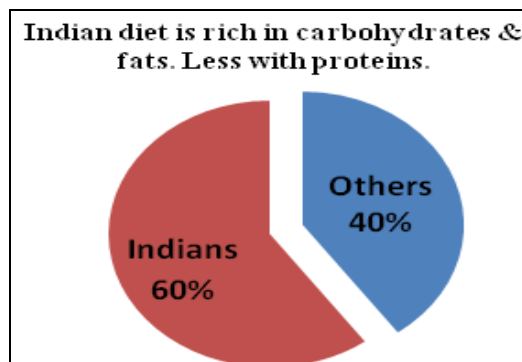


Figure1: Death rate due to heart diseases

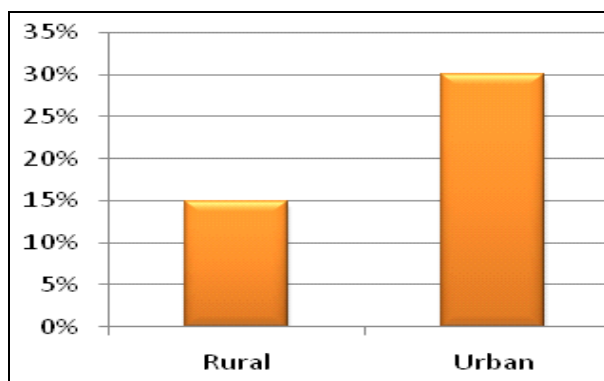


Figure 2: Diabetes ratio in India.

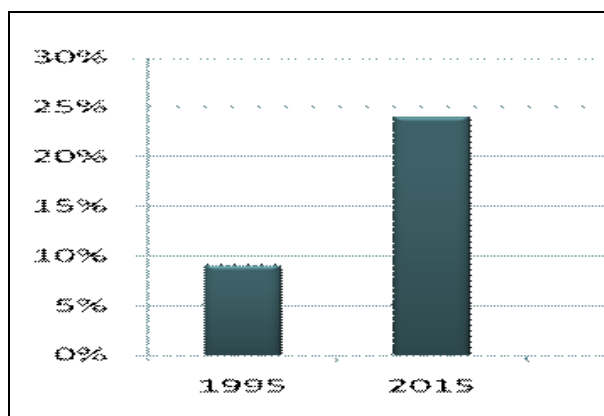


Figure 3: Obesity in India.

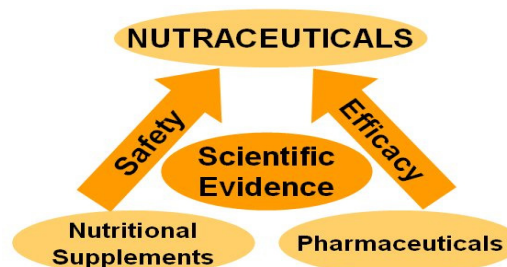


Fig.4 Relation between Nutraceutical, Pharmaceutical and Nutritional supplement.

Role of nutraceutical agents in cardiovascular diseases:

Various nutraceuticals used in cardiovascular diseases like carnitine, N-acetylcysteine, creatine, glutathione, selenium, resveratrol, beta-sitosterol and flavonoids. Carnitine is an amino acid derivative that is found in all cells of the body, especially in striated muscles. It is synthesized in the liver, kidneys and brain from the amino acids lysine and methionine.

Two analogs of carnitine, acetyl-L-carnitine and propionyl-L-carnitine, have been used clinically⁶. It plays an important role in the transport of free fatty acids across the inner mitochondrial membranes for energy production. It is a cofactor in carbohydrate metabolism and has noted to reduce the buildup of toxic metabolites in an ischemic condition. Although its approved indications are primary/secondary carnitine deficiencies, it is widely utilized by patients with a variety of cardiovascular conditions. L-carnitine has reported to have beneficial effect on cardiac function and it has postulated to be cardio protective due to its antioxidant effects⁶. Studies have suggested that it will lower, to a variable extent, plasma triglycerides and elevate high-density lipoprotein cholesterol levels.

Probiotics in kidney health:

When the waste products accumulate in high concentrations in the blood, they become highly toxic and can cause severe damage to many organ systems if they are not properly excreted⁶. Due to the overloaded and impaired kidneys, a buildup of poisonous wastes occurs in the bloodstream. Certain probiotic microorganisms can utilize urea, uric acid, creatinine, and other toxins as nutrients for their growth⁶. They then multiply, thereby creating a greater diffusion of these uremic toxins from the circulating blood across the lining of the intestinal walls into the bowel. This increased microbial growth is excreted along with the faeces (which is normally 50% microbes by weight).

Enteric toxin reduction technology uses probiotic organisms to transform the colon into a blood-cleansing agent, which, with the aid of microbes, indirectly removes toxic wastes and helps eliminate them as faecal matter. Consequently, it is possible to maintain a healthy kidney function with the oral use of Kibow® Biotics. The patented, proprietary probiotics in Kibow® Biotics have been clinically tested and shown to be safe, effective and free of serious side effects when taken for as long as six months. Pharmaceuticals and nutritional supplements having close relationship that gives efficacy and safety to the nutraceuticals which is scientifically proved.

CURRENT STATUS:

Nutraceutical food or food components that help in treatment and prevention of diseases are made from herbal/botanical raw material. This is rapidly growing industry (7-12 % per year) with more than millions of people in the world using these natural products. The global nutraceutical market to reach \$ 450 billion by 2015. According to recent analysis from Euro monitor,

international global sales of health and wellness products are on track to reach a record of about \$1 trillion by 2017, fueled by functional/ fortified products designed to offer specific health benefits⁹.

Table 3: Nutraceuticals with their therapeutic benefits^{3,7}

Name of Nutraceutical	Therapeutic Benefits
Natural Lycopene	Reducing risk of prostate and cervical cancers. Supporting cardiovascular health.
Natural Purified Lutein Esters	Dietary supplement Functional foods Antioxidants.
Garlic	Cholesterol lowering Cardiac diseases Diabetic support
Green Tea	Cancer prevention Weight management Lowering cholesterol
Gymnema, Momordica	Diabetic control
Glucosamine	Arthritis treatment
Ginkgo Biloba	Allergy relief
Digestive Enzymes	Digestive support
Ginseng	Immunomodulator
Phycocyanin Powder	Antioxidant

The Indian consumer's awareness about conventional nutraceutical ingredients is severely limited and nutraceutical manufacture's need to take up the cause and spread awareness about their products to the Indian masses. The global nutraceutical market has seen maximum growth in last decade. In India, beverages and functional food are expected to witness much higher growth rates when compared to dietary supplement over the next five years².

In the Asia Pacific nutraceutical product market, Japan represents the largest consumer, followed by China. India's functional food market is forecast to record moderate growth, with functional foods and beverages forecast to account for almost 71% of the dietary supplement sector in 2017. In Middle East and Africa, dietary supplements represented the fastest growing market segment in the nutraceutical market, recording almost 31% yearly growth between 2007 and 2011.

Non-herbals represented the fastest growing segment, while proteins and peptides was the most lucrative market segment in 2011. In Eastern Europe, nutraceutical products market growth is being fueled by expansion in dietary supplements and functional food market segments. Russia represents the region's largest nutraceuticals consumer¹³. Hungary and Russia forecast to hold just over 20% and just under 24.5% of the nutraceutical market respectively in 2017. Nutraceuticals came into medicinal format such as capsule, tablet or powder in a prescribed dose while modern nutraceuticals are available as forms of food or included in foods or as whole food itself such as probiotic drink and yogurt. There is lack of investment and focus on research and development, imbalance of food provided to the undernourished through government schemes are current challenges⁹.

Table 4: Examples of functional food components^{3,7}

Components	Source	Potential benefits
1) Polyphenols Anthocyanidine Catechin	Fruits Tea, Babul pods, Mustard cake, Rapeseed, Shorea robusta seeds.	Neutralizes free radicals, reduce risk of cancer
Flavanones Flavones	Citrus Fruit, Vegetables, Soybean	Lower cholesterol level Anti-cancer
2) Saponins 3) Probiotics/Prebiotics/Symbiotic Lactobacillus	Soybean, GNC, Lucerne Yoghurt	Improve GI health
Fructo-oligosaccharides 4) Phytoestrogens Diadzein Genistein Lignans	White grain, Onions Soybean, Flax, Maize Berseem clover, Lucerne Flax, Rye, Vegetables	Reduce menopause symptoms, improve bone health Reduce cancer and heart disease
5) Dietary Fibres Insoluble fibres β Glucan Whole grains	Wheat bran Oats Cereal grains	Reduce breast, colon cancer Reduce CVD
6) Carotenoids β Carotene, Zeaxanthin, Lutein	Clover, Lucerne, Oats, Corn, Carrots, Vegetables, Fruits	Neutralize free radicals, Healthy vision

To overcome that challenges we should encourage research in the field of nutraceuticals by funding, provide R & D infrastructure support to nutraceutical players for conducting research also there should be collaboration between industry and academia and increase public- private partnership⁹.

REGULATORY ASPECTS:

The primary set of rules governing the nutraceutical market is the Dietary Supplement Health and Education Act (DSHEA) passed in 1994⁶. The Food Safety and Standard Rule, 2011 have been issued. Food Safety and Standard Authority has also issued regulations with respect to Licensing and registration of food business, manufacturing, packing and labeling, food product standard etc.

The Food Safety and Standard Rule and Regulations are effective from August 2011. This act will encourage manufacturers for product Research and Development; develop reliable protocols and carryout clinical studies. Foreign Direct Investment Act passed recently in 2012 that also provide new opportunities for international firms to manufacture and sale nutraceutical products in India.

Thus, there is only single authority to regulate production, distribution and marketing of nutraceuticals in India¹³.

CONCLUSION:

The global market is currently experiencing period of growth post recession even after effect of recession fades, the market for nutraceutical is likely to remain in the growth phase which is driven by emerging market of countries like India, China, Brazil etc. In case of plant extracts and phytochemicals, various Indian companies have entered their place as supplier both locally as well as globally, which will help in flourishing nutraceuticals sector in near future.

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REFERENCE:

- 1) Raj KK. Nutraceutical and Functional Food as Future Food: A Review, *Scholars Research Library* 2 (1); 2010: 106-116.
- 2) Rajasekaran A, Sivagnanam G, Xavier R. Nutraceuticals as therapeutic agents: A Review. *Research J. Pharm. and Tech.* 1(4); 2008: 328-340.
- 3) Sarin R, Sharma M, Singh R, Kumar S. Nutraceuticals; Review, *International Research Journal Pharmacy*, 3 (4); 2012: 95-99.
- 4) Palthur MP, Palthur SS, Suresh KC. Nutraceuticals: concept and regulatory scenario, *International Journal of Pharmacy and Pharmaceutical Science* 2(2); 2010: 14-20.
- 5) Ekta KK. Nutraceutical- Definition and Introduction, *AAPS PharmSci* 5 (3); 2003: 27-28.
- 6) Kathleen C, Stephen D. Nutraceuticals: What Are They and Do They Work? Kentucky Equine Research, Inc. Versailles, KY 7 (4); 2013:1-50.
- 7) Patil CS. Current trends and future prospective of nutraceuticals in health promotion, *BIOINFO Pharmaceutical Biotechnology* 1 (1); 2011: 01-07.
- 8) Policy paper on nutraceuticals/functional foods and health claims on foods, Therapeutic Products Programme and the Food Directorate from the Health Protection Branch, 1998.
- 9) Ajit S. Nutraceuticals- critical supplement for building a healthy India, Ernst and Young, FICCI task force on nutraceuticals; 2012: 1-80.
- 10) American Nutraceutical Association, 2009.
- 11) Stephen D. A report of National Nutraceutical Centre, Nutraceuticals India 2012 webinar; 2012: 1-22.
- 12) Faisal N, Varma KS. Nutraceuticals and its impact on health care. May 14, 2009.
- 13) Smarta RB. Regulatory Perspective of Nutraceuticals in India, Interlink Marketing Consultancy Pvt. Ltd. Report; 2012: 1-12.(www.interlinkconsistency.com)
- 14) <http://en.Wikipedia.org/nutraceuticals>
- 15) Freedonia group. World Nutraceutical Ingredients, industry study with forecast for 2013 and 2018; 2009: 1- 487. (www.freedoniagroup.com)