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Neutraceutical and its Impacts on Health Care

[1]Prafull N Annadate, [2]Pooja Bhonde, [3]Dr Gajanan Sanap

[1]Student, [2]Assistant Professor, [3]Principal

[1,2,3]Late Bhagirathi Yashwantrao College of Pharmacy,Pathri, Chatrapati Sambhajinagar, Maharashtra, India ,431001

Abstract

Nutraceutical is a combination of the words "nutrition" and "pharmaceutical." Nutraceuticals in general, are foods or parts of foods that play an important role in modifying and maintaining health and normal physiological function that keeps humans healthy. The current population and health trends are the primary drivers of the global nutraceutical market's growth. Dietary fibre, prebiotics, probiotics, polyunsaturated fatty acids, antioxidants, and other herbal/natural foods are examples of food products used as nutraceuticals. These nutraceuticals aid in the treatment of some of the century's most serious health issues, such as obesity, cardiovascular disease, cancer, osteoporosis, arthritis, diabetes, cholesterol, and so on. Overall, the term "nutraceutical" has initiate in a new era of medicine and health, in which the food industry has evolved into a research laboratory.

Introduction

Urbanization, industrialisation, stressful schedules, and shifting cultures have all contributed to significant changes in human lifestyles during the past five centuries. These influences have altered human eating patterns and forced people to consume quickly, quickly prepared meals, fast food, and junk food. The nutritional value of our diet has been directly impacted by these habits, which have gradually reduced nutrient quantity and quality. Due to these modified eating patterns, immunological dysfunctions, metabolic problems, and degenerative diseases are now more common. People are becoming more aware of their health in recent years and are highly concerned with health management. Revolutions in medicine, phytomedicine, nutritional science, the food business, and health care over the past two decades have attracted a lot of public and professional attention .[1]

The term "nutraceuticals" was coined in 1989 by stephen De-Felice, and he was founder chairman of “Foundation for Innovation in Medicine ” (FIM), an Americian organization located in Cranford, New Jersery. He described it as "food or portion of food that delivers medical and health advantages, including prevention and/or treatment of disease." [10][41] Particularly in the ancient Indian ayurvedic system, herbal plants were historically widely used in the treatment and prevention of a variety of illnesses. Since ancient times, people have used spices like cinnamon and cloves. [4] The creation of nutraceuticals, which have beneficial health effects, comes from botanical sources. Nutraceuticals include macronutrients including proteins, minerals, and amino acids that are sourced from plants or animals in addition to or instead of meals. Recent studies have shown that numerous nutraceuticals are effective in treating a variety of illnesses, such as bone problems. [3]

There is a misperception that nutraceuticals are absolutely safe because they are made from herbal natural sources and have been used for a long time without any damage. It is impossible to tell whether this is true for all nutraceuticals, albeit it may be for some of them. Impurities in these items as well as nutraceutical component products have been linked to negative effects of dietary supplements. These pollutants have the potential to cause anything from a minor rash to respiratory infections, neurological and reproductive difficulties, or even complete diseases. Cancer, cardiovascular damage, hepatic and renal failure, and neurological diseases are only a few of the hazardous effects of heavy metals. Toxicities associated with the contents of dietary supplements include increased risk of hyper calcaemia brought on by the interaction of calcium and vitamin D supplements with digoxin/thiazide diuretics, and abrupt bleeding after sustained high dosage Ginkgo biloba exposure. St. John's Wort (Hypericum perforatum), cinnamon, and aloe vera are linked to cancer, liver damage, genotoxicity, and mutagenicity. The role of dietary active ingredients is one of the most significant areas of research. Chemicals in human nutrition, with the results having a variety of ramifications for customers, medical experts, policymakers, and business.[3] The reaction of nutraceuticals differs from person to person. In order to gain the most therapeutic benefits and prevent any serious adverse effects, nutraceuticals must be free of contaminants or be eaten within the tolerance limits of contaminants established by regulatory agencies. [4]

Strict rules (regulations, standards, or conditions) on pollutants and their permissible limits have been established by regulatory bodies. Therefore, it is essential that the procedure adhere to these guidelines. The objective of this study is to quantify commonly used nutraceutical ingredients (vitamin D, calcium, lycopene, and lutein) in marketed formulations in order to verify the accuracy of label claims and to investigate the presence of heavy metals (lead, cadmium, arsenic, and mercury). The level of determined contaminants and nutraceutical components was then tested for compliance with nutraceuticals requirements. Supplementing with nutraceuticals and wild foods, as well as living a wild lifestyle, are thought to be protective. Western food and lifestyle, however, may increase the expression of genes linked to chronic disease. It's difficult to pinpoint which mirana sequences are at fault. Using a quick and precise real-time PCR method, it is now possible to identify miRNA expression patterns that correlate with disease biological traits. The prevalence and severity of obesity, diabetes, and cancer varies depending on genetic susceptibility and the presence of risk factor. [5]

Historical Development:

Over 3000 years have passed since the invention of nutraceuticals. Hippocrates (460–377 BC). Civilized communities have been deeply interested in and concerned about the safety of their food supply throughout history. [8] Philosophers and later doctors were interested in the impact of daily diet on personal and societal health long before nutrition became a separate scientific field. Let food be thy medicine and medicine be thy food, said the father of modern medicine. He was the first to propose the theory that specific foods could serve as an alternative to pharmacological therapy for the treatment of an infection. Evidently understanding the underlying link between nutrition and health, Hippocrates stressed that "differences of diseases depend upon nutriment." [9]

Nutraceuticals are seen as dietary components in India that are produced from locally grown or naturally occurring, unprocessed ingredients and are used to prevent or treat a variety of chronic and severe ailments. [18] Ayurveda, the definitive manual for Indian medical services, provides significant evidence that food can be used to prevent or treat illness. The therapeutic value of many tastes, such as coriander, fennel, cumin, garlic, turmeric, and so on, was highly regarded by the Egyptians, who strangely compared them to priceless metals like gold. [20] Homegrown nutraceuticals are effective tools for promoting health and acting against chronic, severe illnesses that are caused by healthy behaviours by promoting optimal health, longevity, and personal pleasure. [21]

CLASSIFICATION OF NUTRACEUTICALS

Probiotics: Microbes are thought to have numerous applications in the medical industry and human health. Probiotics are living yeast or bacteria that are beneficial to your health. They can be discovered in dairy products. in addition to controlling how the digestive tract functions, they also contain antioxidant characteristics. They function to control the development of the gut flora. Probiotics are chemicals that spur microbial activity or growth (bacteria or fungi) Nutritional fibres.

Non-starchy, inefficiently absorbed carbs can be found in vegetables, fruits, wheat bran, and oats. Diets high in fibre help the digestive tract by reducing the risk of ulcerative colitis and Crohn's disease. These fibres have isolated nondigestible components that have favourable physiological effects on people. [4]

Dietary fibers are of two type Water :

1] Insoluble fibers.

2] water soluble fibers

Daily recommended intake is 30-40gms.

SOURCES:

Whole grain cereals , wheat products , Oats, dried beans, legumes Table 1: The Best High-Fiber Foods.

Fibrous food	**Content offiber (gram)**
Split peas	16.3 gram per cup
Lentil	15.6 gram per cup
Black beans	15 gram per cup
Lima beans	13.2 gram per cup
Brussels Sprouts	10.3 grams per medium Vegetable

Table No 1 Sources [6]

Functional Foods: With the help of functional meals, people are supposed to be able to eat substantial portions of food in their natural state as opposed to taking nutritional supplements in the form of liquid or capsules. Sometimes complementary minerals like vitamin D are added to milk as an example. such as psyllium, bran, and oats and lignins for colon cancer and heart disease Oligofructose as a prebiotic for the treatment of gut flora and reduced-triglyceride canola oil for decreasing cholesterol. [7]

Antioxidant Vitamins: Antioxidants are crucial for maintaining good health and wellbeing since they serve as our first line of defence against free radical damage. Oxygen is a very reactive atom that can mix with other atoms to create free radicals, which are potentially dangerous substances. Targeting healthy body cells gives them the power to destroy their structure and function. For cellular and systemic health and wellbeing, antioxidants are crucial. A strong and sophisticated antioxidant defence mechanism has been established in humans. It is made up of several parts that are both endogenous and exogenous in origin.

Antioxidant enzymes: Enzymes including glutathione peroxidase, superoxide dismutase, and glutathione reductase catalyse the activities that quench free radicals.

Dietary Antioxidant:

-Vitamin C

-Vitamin E

- Betacarotene and other carotenoids and oxycarotenoids Such as lycopene and lutein Polyphenols ,e.g, flavonoids ,flavones and flavonols Proanthocyanidins.

Nutrient-derived antioxidants: Vitamin C, tocopherols and tocotrienols (vitamin E), carotenoids, and other low molecular weight molecules including glutathione and lipoic acid are all good sources of ascorbic acid.

Metal Binding Proteins:

Albumin(copper)

Myoglobin (iron)

Transferrin(iron).[3]

Medical Foods : Specially developed and designed for the nutritional management of diseases with particular needs that cannot be satisfied by a standard diet alone are known as medical foods. [7] A food that is designed to be consumed or administered internally under the supervision of a doctor and is intended for the specific dietary management of a disease or condition for which distinctive nutritional requirements, based on acknowledged scientific principles, are established by medical evaluation is referred to as a medicinal food. Medicinal food is also free of any ingredients that promote disease condition or contains a specific nutrient that the body cannot normally produce due to a condition is also known as a therapeutic food. It is prescribed by doctors for conditions including, phenylketonuria, celiac disease, and lactose intolerance, among others that cause impaired digestion, absorption, or metabolism of traditional foods. [6]

Farmaceuticals: In agricultural industries, the term farmaceuticals is more commonly connected with medical applications of genetically altered crops or animals. Farmaceutical is a term that combines the terms farmand pharmaceutical. It refers to medicinally beneficial compounds obtained from GE plants or animals (usually through biotechnology). Transgenic plants for infectious disease or vaccination, for instance, transgenic cows and lacto ferrin immunological enhancement. It refers to medicinally beneficial compounds obtained from GE plants or animals (usually through biotechnology). For instance, transgenic plants for the treatment of infectious diseases or vaccination against them.

Nutraceuticals and their sources:

Chemical constituent	**Source**	**Uses**
Carotenoids		
1. Lycopene	Guava, papaya, watermelon, Tomatoes, pink colored grapefruit.	They reduces cholesterol levels, antioxidants, protects against cancer.
2. β-Carotene	Vegetables, Carrots.. fruits, oats,	Antioxidants, protection of cornea against UV Light
3. Lutein	Spinach, corn, avocado , egg Yolk	Protect eyes against age related Muscular degenerations, cataracts, anticancer activity(colon).
4. Tocotrienol	Palmoil ,different grains	Improves cardio vascular health, fight against cancer (breastcancer).
5. Saponins	Bean like chickpeas.	soya

Polyphenolic Compounds		
1. Flavonones	All citrus fruits.	Different types of anti-oxidant And anticancer activity.
2. Flavones	Different types of fruits, soyabeans, vegetables.	Different types of anti-oxidant and anti-cancer activity.
3. Flavonols	Broccoli, tea, onions, fruits like apple.	Anti oxidant activity
4. Curcumin	Turmeric root	Strongly anti-inflammatory and strongly antioxidant, effective anticlotting agent
5. Glucosinolates	Cauliflower, cruciferous vegetables	Anti cancer activity, protect against bladder cancer

Phytoestrogens		
Isoflavones	Legumes, beans like soybeans.	It Lowers LDL cholesterol, antioxidants, protects against prostate, breast ,bowel and other cancers.
Lignans	Vegetables and flax seed.	Protect against development of cancer like colon and breastcancer.

Dietary fibre		
Soluble fibre	Beans like Legumes, cereals like oats, barley, some fibrous fruits.	They help in maintenance of a healthy digestive tract & have anticancer activity.
Insoluble fibre	whole grain foods wheat and corn bran, nuts.	They help in maintenance of a healthy digestive tract, and have Anticancer (colon) activity.
Sulphides/Thiols	Present in Cruciferous vegetables.	Help in maintenance of healthy immune function.

Fatty Acids		
Omega 3 fatty acids	Present in salmon and flax seed.	They are the Potent controllers of the inflammatory processes, help in Maintenance of brain function & reduce cholesterol disposition.
Monosaturated fatty acids	Present in tree nuts.	Reduce the risk of coronary heart disease.
Prebiotics / Probiotics	Lactobacilli, bifidobacteria present in yogurt, other dairy and non dairy applications.	They help to improve gastrointestinal health and systematic immunity.
Minerals like zinc, calcium, selenium, copper, potassium.	Food	They are the important constituents of balanced diet.
Polyols sugar alcohols (xylitol,sorbitol).	Present in foods	They may reduce the risk of dental caries (cavities).

Table No 2 (Nutraceuticals and their sources) [3]

Methodology:

We also looked for freshly published articles on various nutraceutical topics as an alternative to pharmacology. Among the terms used were "nutritional," "allergy," "alzheimer," "cardiovascular disease," "cancer," "diabetes," "eye disease," "immunological," "inflammatory," or "Parkinson."

Alzheimer's disease and nutraceuticals: In terms of dementia, Alzheimer's disease (AD) is the most prevalent type. The illness has no known treatment and finally results in death. AD is typically diagnosed in patients over the age of 65. [26] Nutritional supplements and cardiovascular illnesses.

CVD (Cardiovascular disease):- The prevalence of CVD (cardiovascular disease) and research in this field are both rising globally. [35] The word "CVD" refers to conditions affecting the heart and blood vessels, and it encompasses conditions like coronary heart disease (heart attack), peripheral vascular

disease, cerebro vascular disease (stroke), hypertension, heart failure, and more. It is thought that a low consumption of fruits and vegetables is linked to a high death rate for cardiovascular disease. [32]

Cancer and nutraceuticals:- A significant public health issue in emerging nations is cancer. According to the World Cancer Report, there will be 15 million new cases of cancer, or a 50% increase, in the year 2020. Cancer can be prevented with a healthy lifestyle and nutrition. [31]

Immune system and nutraceuticals:- Immune system function can be enhanced by using nutritional supplements that fall under this category. Cone flower extracts or plants from the genus Echinacea, such as Echinacea angustfolia, Echinacea pillida, and Echinacea purpurea, are among the ingredients. Particularly the native to the central United States, coneflowers are utilised as a common herbal treatment there. Astragalus mongolicus, oestrogen receptor modifiers used in hormone replacement therapy nowadays. Both morphine and garlic are effective examples of nutraceuticals because they, respectively, activate and depress the immune system. [33], [34]

Nutraceutical products :

Nutraceutical products are defined as substances that have physiological benefits or offer defence against chronic disease. Utilizing nutritional supplements can help people stay healthy, delay the ageing process, prevent chronic diseases, live longer, and maintain their bodies' structural and functional integrity.

Different types of neutraceutical product

1. **Tablets:-**

These are a few illustrations of tablet neutraceuticals, which are simple to use, convenient

and portable. The majority of plants are extracted to make tablets.

Fig No 1.(Flue Tablets)

Fig No 2.(Multivitamin Tablets)

Fig No 3 (Iron Tablets)

Fig No 4 (Calcium Tablets)

2. **Creams:-**

Natural plant extracts from plants, such as aloe leaf extract and fruit juices, are likely used to make nutriacosmetic creams. Creams can quickly cover large areas of skin because of their high water content, which makes them rapidly absorbed. They are excellent for treating dry skin, rashes, and skin lesions because they stay on the surface of your skin's surface to assist prevent moisture loss.

Fig No 5 (Anti Ageing Creams)

Fig No 6 (Skin Care Products)

Powders:-

Most often, powders are made by using the extraction method. Powders are widely used over the world and have a lengthy shelf life. Powder dose forms are more physically and chemically stable than liquid dose forms. In powder dose forms, the medicinal product is less likely to be contaminated by microorganisms. It is an easy approach to give the medication when the dose is relatively significant. Both paediatric and geriatric patients enjoy using it.

Fig No 7 (Protein, Bcaa, Creatin Powders)

Discussion

In addition to their potential for therapeutic benefit, nutraceuticals have recently attracted significant research for their potential nutritional and safety profiles. Companies in the pharmaceutical and food industries are aware of the shifting trends brought on by the benefits of these chemicals. Numerous therapeutic advantages can be found in the majority of nutraceuticals. The health advantages are caused by nutraceuticals, which are present in many fruits and vegetables. Nutraceuticals may be frequently consumed to treat or lower risk factors like high cholesterol, high blood pressure, and diabetes because of their health advantages. Botanicals including ginseng, ginkgo biloba, St. John's wort, and Echinacea are among the most well-known nutraceutical products on the market today. [35]

Importance:

Functional foods and nutraceuticals offer several benefits. Increase the nutritious value of meals and aid in disease prevention. Nutraceuticals are dietary supplements that aid in the diagnosis, treatment, and cure of diseases as well as the prevention and therapy of those diseases. [7]

Conclusion:-

Particularly in the prevention and/or treatment of acute and chronic illnesses, nutraceuticals can significantly affect one's health. It is, nonetheless, still evolving. Considerations include its effectiveness, safety, and potentially detrimental long-term repercussions. Nutraceuticals are compounds that provide physiological advantages or offer protection from chronic diseases. The use of nutraceuticals can be used to support the structure or function of the body, promote health, slow down the ageing process, avoid chronic diseases, and lengthen life expectancy. Bone health depends on both calcium and vitamin D. The majority of one's daily calcium and vitamin D needs can be satisfied by consuming enough calcium and vitamin D in one's diet and getting enough sunshine. However, due to the high prevalence of calcium and vitamin D insufficiency in India.

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