



Significant Role of Nutraceuticals in Various Disease

Priyanka Purushottam Ramteke¹, Manoj Jagannath Rathod², Swapnil Mahadeo Wankhede³, Dr. Gajanan Daphal⁴, Dr. Swapnil Deo⁵

^{1,2,3,4,5}Dr Uttamrao Mahajan College of B Pharmacy, Chalisgaon Dist. Jalgaon, 424101

ABSTRACT

Because of their supposed safety and possible nutritional and therapeutic advantages, nutraceuticals have attracted a lot of interest. The idea for nutraceuticals came from a survey conducted in the UK, Germany, and France that found consumers place a higher value on nutrition than on exercise or inherited factors for maintaining good health. Nutraceuticals, which offer health advantages and serve as an alternative to contemporary medicine, have attracted increasing attention in recent years. Using nutraceuticals may make traditional pharmaceuticals unnecessary or less necessary, lowering the possibility of any negative side effects. The chemical effects of nutraceuticals are frequently distinct from those of medicines. Modern-day ailments like obesity, osteoporosis, cancer, diabetes, allergies, and dental issues are being fought worldwide. Exercise and nutrition both play important roles in the prevention and treatment of obesity, which is becoming more prevalent throughout the world. Major components of nutraceuticals include nutrients, herbs, and dietary supplements, making them essential for preserving health, fighting off various illness conditions, and enhancing quality of life. It is well known that food products can be used to prevent illness and treat it. The majority of medication compounds utilised today in formulations were once used in their basic form.

Keywords: Nutrient, Disease and treatments, Future food, Medicine.

Introduction:

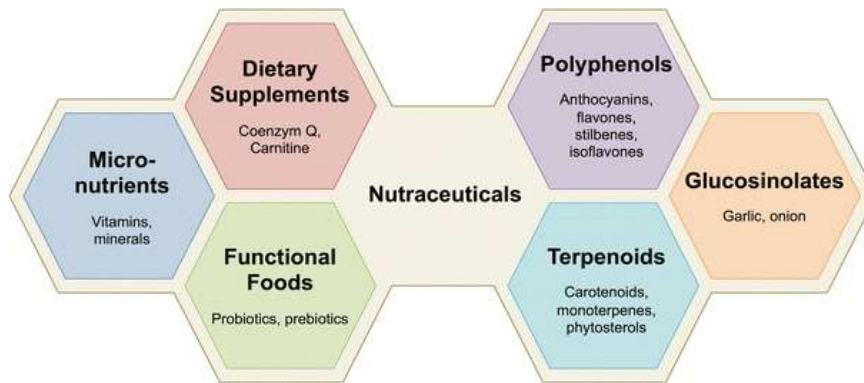


Food directly affects health, according to epidemiological studies on the connection between dietary practises and disease risk. The general consensus is that foods made from plants, including wine, fruits, nuts, vegetables, cereals, legumes, spices, etc., have some positive impacts on human health, especially with regard to age-related disorders. Chronic age-related illnesses like cardiovascular disease, neurological disease, type II diabetes, and various types of cancer (including gastrointestinal cancer), which are known to be correlated to dietary habits, continue to increase as the human population lives longer. This fact has prompted numerous health groups to advocate increasing the consumption of plant-based foods in order to enhance human health and prevent the onset of these diseases.

Meals and nutrients are essential to the body's normal operation. They aid in preserving one's health and lowering the danger of contracting certain ailments. Nutraceuticals are therapeutic foods that contribute to overall health maintenance, improved immunity, and the prevention and treatment of particular diseases. Hence, one of the pieces missing from an individual's health

benefit can be seen in the field of nutraceuticals. The effectiveness of nutraceuticals in treating and preventing a wide range of illness disorders has been scientifically demonstrated and is supported by several research studies.

Nutraceuticals:



➤ **Dietary Supplements:**

Dietary supplements are items that are taken orally and contain a nutritional element that is meant to enhance the flavour of the food you eat. Black cohosh for menopausal symptoms, ginkgo biloba for memory loss, and glucosamine/chondroitin for arthritis are a few examples of dietary supplements. They also fulfil specialised purposes including meal replacements, weight-loss supplements, and sports nutrition. Vitamins, minerals, herbs or other botanicals, amino acids, enzymes, organ tissues, gland extracts, or other nutritional elements may be found in supplement ingredients. In addition to tablets, capsules, liquids, powders, extracts, and concentrates, they are also available in other dosage forms. (1)

➤ **Micro- nutrients:**

Five micronutrients—vitamin B6, vitamin C, vitamin E, magnesium, and zinc—play roles in preserving immunological function, and immune-booster pills frequently contain doses of these minerals that are significantly higher than the RDA. Nevertheless, there is no proof that taking these supplements has any additional advantages over eating a balanced diet. It is advisable to employ diverse foods to strengthen your immune system rather than consuming tablets to obtain these micronutrients. (2)

➤ **Functional Foods:**

Beyond only providing basic nourishment, dietary components have positive effects that have sparked the development of functional foods and nutraceuticals. For one customer, a functional food may work as a nutraceutical. Citrus fruits and fortified dairy products (like milk) are examples of nutraceuticals (e.g., orange juice) Several naturally occurring dietary ingredients have been investigated as potential cancer treatments. Examples of nutraceuticals with a large body of research on their effects on human health include vitamin E, selenium, vitamin D, green tea, soy, and lycopene. (3)

Polyphenols:

Red grapes and the products that are made from them, as well as other naturally occurring dietary sources, are rich in polyphenols. These substances are linked to the protection of oxidative stress-related illnesses. The activity of grape polyphenols against illnesses is discussed in this review, along with new polyphenol-rich compounds created for use as nutraceuticals. Grape polyphenols have been shown to maintain endothelial function, boost antioxidant capacity, and protect against LDL oxidation, among other effects. Recent patents on polyphenols demonstrate a propensity for using a right-on-target strategy, and the new patented medicines are intended to prevent and treat particular ailments.

➤ **Terpenoids:**

Terpenoids have been discovered to have antibacterial, antifungal, antiparasitic, antiviral, anti-allergenic, antispasmodic, antihyperglycemic, antiinflammatory, and immunomodulatory characteristics, making them effective in the treatment and prevention of a number of illnesses, including cancer. (5) Terpenoids can also be utilised to safeguard agricultural products when storing them because they are known to have insecticidal qualities. (6).

➤ **Glucosinolates:**

Among the most unique nutraceutical components found in cruciferous vegetables, such as broccoli, are glucosinolates. They have been the subject of extensive investigation because of their significant potential to prevent chronic diseases, particularly cancer. (7)

NUTRACEUTICALS AND DISEASES

Cardiovascular Diseases:



Heart and blood vessel illnesses collectively known as cardiovascular diseases (CVD) include hypertension (high blood pressure), coronary heart disease (heart attack), cerebral vascular disease (stroke), heart failure, peripheral vascular disease, etc.

For the prevention and treatment of CVD, nutraceuticals such as antioxidants, dietary fibre, omega-3 polyunsaturated fatty acids (n-3 PUFAs), vitamins, and minerals are advised in addition to physical activity. It has been established that chemicals found in grapes and wine, such as polyphenols, change cellular signalling and metabolism, which is linked with a decrease in artery disease. Onion, endives, cruciferous vegetables, black grapes, red wine, grapefruits, apples, cherries, and berries are all rich sources of flavonoids. (8)

Plants produce flavanoids as flavones, which include the flavonoid apigenin found in chamomile, and flavanones, which include hesperidins found in citrus fruits and silybin in milk. The treatment of cardiovascular disorders is greatly aided by thistle flavonols (tea: quercetin, kaempferol, and rutin grapefruit; rutin buckwheat; ginkgo flavonglycosides - ginkgo)24. (9)

By inhibiting the "suicide" enzyme cyclooxygenase that breaks down prostaglandins, flavonoids prevent blood pressure-raising angiotensin-converting enzyme (ACE) and platelet stickiness and aggregation. The tiny capillaries that deliver oxygen and vital nutrients to all cells are strengthened by flavonoids, which also safeguard the vascular system. Flavonoids reduce the risk of malignancies brought on by oestrogen by blocking the enzymes that create oestrogen. (10)

Diabetes:



Blood glucose levels in people with diabetes mellitus are unusually high, either as a result of insufficient or poor insulin synthesis. Type 2 diabetes, which is connected with obesity and has a 95% prevalence, is the most prevalent kind of diabetes. Despite the introduction of numerous medications for the prevention and treatment of diabetes, the overall number of persons with the disease, which has many causes, is rising internationally.

Diabetes throws a significant financial strain on society in addition to placing a significant financial burden on each patient and their families.

Recent preclinical research have shown a wide range of herbal dietary supplements and herbal medications to be beneficial for type 2 diabetes mellitus; however, only a small number of these studies have been adequately planned randomised clinical trials.

Isoflavones and phytoestrogens	Isoflavones and phytoestrogens that resemble human oestrogen in structure and activity. The most extensively researched isoflavone is soy, and it has been found that eating soy has a decreased incidence and mortality rate for type II diabetes, heart disease, osteoporosis, and several malignancies.
Omega-3 fatty acids	In those prone to diabetes, omega-3 fatty acids may lower glucose tolerance. As long chain n-3 fatty acid production depends on insulin, the heart may be more vulnerable to their depletion in diabetes. Patients with diabetes may benefit from n-3 fatty acid ethyl esters.
Lipoic acid	Antioxidant lipoic acid appears to be helpful as a long-term dietary supplement for protecting diabetics from problems and is used to treat diabetic neuropathy. Dietary fibres from psyllium have been widely utilised as food additives, pharmaceutical supplements, and ingredients in processed foods to help people lose weight, control their blood sugar levels when they have diabetes, and lower their cholesterol levels when they have hyperlipidemia. Many plant extracts, including those from bitter melon, cinnamon, and Toucrium polium, have been found to either prevent or treat diabetes. (11)

Nutraceuticals in Stem Cell Therapy:

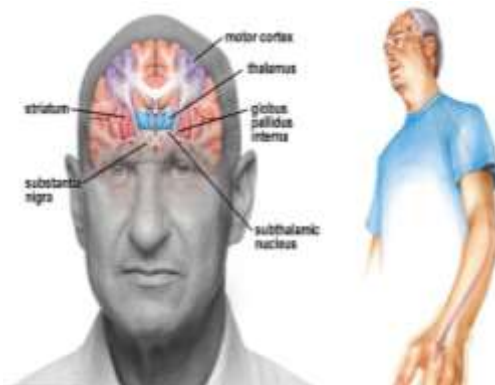


Stem cell research has recently been proven to be useful in treating a number of disorders. As an alternative to stem cell transplantation, several researchers have also looked at the effects of specific nutraceuticals on stem cell development and proliferation, which could encourage indigenous stem cells to achieve healing and regenerative goals. (12) Bickford et al. reported a dose-related effect of blueberry, green tea, catechin, carnosine, and vitamin D3 on proliferation with human bone marrow compared with human granulocyte macrophage colony-stimulating factor, and combinations of nutrients can synergistically promote proliferation of human hematopoietic progenitors, suggesting another potential role or mechanism by which nutraceuticals promote health and the capacity of the human body to heal itself. (13)

Therefore, it is important to carefully evaluate any medicine during pregnancy, including herbal remedies. For the health of future generations, the impact of dietary supplements on expectant mothers, newborn development, and child differentiation are crucial. It is thought that nutritional factors during early development have long-term implications on adult health, illness risk, and death rates in addition to short-term effects on growth, body composition, and bodily functioning. (14)

There are hints that some nutraceuticals, such as antioxidant vitamins, vital amino acids, and polyunsaturated fatty acids, in baby food, may have positive impacts on the immune system's development. In fact, calcium, phosphorus, magnesium, iron, zinc, and vitamins D and K are crucial for the formation and development of bone and the human nervous system. (15)

Parkinson's Disease:



Parkinson's disease is a brain ailment that often affects people in their mid- to late-adult years and is brought on by nerve damage in certain areas of the brain. It causes tight muscles, trembling, and difficulty walking. According to Canadian experts, dietary vitamin E may offer protection against Parkinson's disease. (16)

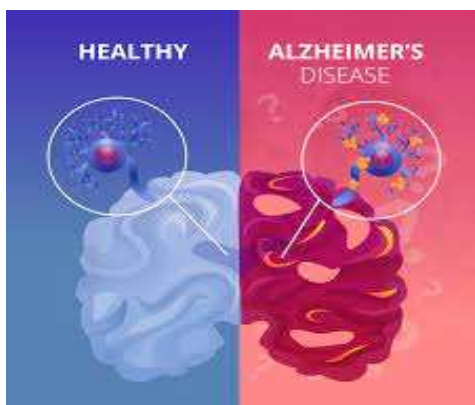
A decrease in the clinical indicators suggested that creatine appeared to alter the characteristics of Parkinson's disease. In order to understand glutathione's impact on the nervous system and its antioxidant potential, researchers have also researched it. It is still unclear what the best long-term dosage, adverse effects, and administration technique are. Although exploratory research on nutritional supplements has shown some encouraging findings, it is vital to keep in mind that there is not yet enough evidence to prescribe them for Parkinson's disease. Patients need to be informed that over-the-counter medications do have negative effects, interact with other prescriptions, and cost a lot of money. (17)

Obesity:



An energy imbalance occurs when energy intake exceeds energy expenditure, and the result is obesity. Modifying one or both of the components of energy balance is necessary to combat obesity, whether through prevention or treatment. Food intake, energy expenditure, and energy storage are thus three different areas of the energy balance systems that can be targeted by weight control strategies (including a functional diet strategy). Pharmaceutical businesses already employ all of these strategies, but creating functional meals intended to help people control their weight may be a more appealing way to address the 61% of the population that is currently overweight or obese. (18)

Nutraceuticals' current status in treating obesity In order to prevent and treat obesity, which has a relatively high incidence worldwide, nutrition and exercise are crucial. Nutraceuticals with possible anti-obesity qualities include conjugated linoleic acid (CLA), capsaicin, *Momordica charantia* (MC), and psyllium fibre (19). The nutritional supplement's combination of glucomannan, chitosan, fenugreek, G Sylvester, and vitamin C dramatically lowered body weight and encouraged fat reduction in obese people. To determine long-term efficacy and adverse effect possibilities, more research is required (20).

Nutraceuticals against Alzheimer's disease (AD):

The most prevalent type of dementia is Alzheimer's disease (AD), also known as senile dementia of the Alzheimer type (SDAT), primary degenerative dementia of the Alzheimer's type (PDDAT), or simply Alzheimer's. The following are some of the various dietary supplements that are used to treat Alzheimer's disease:-

Antioxidants are crucial in the treatment of practically all illnesses because oxidative stress plays a significant role in the majority of chronic illnesses. Neurodegenerative illnesses like Alzheimer's disease (AD), Parkinson's disease (PD), and Huntington's disease are mostly caused by oxidative stress (HD). The ageing process accelerates oxidative stress, as does a diet deficient in antioxidants. Several studies have linked a high intake of dietary antioxidants with a reduced risk of AD, which is crucial because preventing disease is far simpler than treating it. So, prevention is essential, and studies indicate that avoiding AD is actually not that difficult.

Antioxidant therapy offers a potential solution for delaying the onset of disease. It is currently being investigated whether vitamin E actually decreases the course of AD. The patients were divided into two groups for assessment purposes: one group received treatment with 1000 IU of vitamin E and at least 5 mg of donepezil (Aricept), and the other group received no vitamin E at all. The results revealed that individuals undergoing permutation therapy degenerated at a markedly lower rate. Studies on food usage have produced similar results. Antioxidants are present in abundance in food; they range from flavonoids to well-known antioxidants like vitamin E and vitamin C. (21)

Alpha-lipoic acid ALA also contributes to proper brain function. The biological traits and hallmarks of AD are oxidative stress and decreased energy. Strong antioxidant alpha lipoic acid helps the brain's ingestion and metabolism of glucose. In a 337-day open research, Hager et al. provided 600 mg of ALA daily to nine patients with AD and associated dementia who were previously on typical acetyl cholinesterase inhibitors. The MMSE and AD assessment scale scores of individuals who received the ALA exhibited a stabilisation of cognitive function, according to the results. (22)

Phosphatidylserine is quite intriguing. The main phospholipid in the brain, phosphatidylserine, is responsible for the fundamental structure of the cell membrane. Cell-to-cell communication and the delivery of biochemical letters to the cell are fundamentally dependent on membrane phosphatidylserine and phospholipids. The oral supplement phosphatidylserine improves neuronal membranes, cell metabolism, and certain neurotransmitters, including acetylcholine, nor-epinephrine, serotonin, and dopamine. Phosphatidylserine has been the subject of numerous double-blind, placebo-controlled studies, and they demonstrate that it can significantly reduce the risk of developing early dementia, early Alzheimer's disease, and age-related cognitive decline. (23)

Cancer & Nutraceuticals:

A significant public health issue in emerging nations is cancer. According to the Global 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. The group of photochemicals known as carotenoids is in charge of giving meals their various colours. They are good at preventing cancer and have antioxidant properties. Lycopene's importance to human health, particularly in the treatment of cancer, has drawn attention to carotenoids recently..

Daidzein, biochanin, isoflavones, and genistein-rich plants also slow the growth of prostate cancer cells. Lycopene is thought to be a strong antioxidant and a single oxygen quencher because of its unsaturated nature. Lycopene concentrates in the skin, adrenal, prostate, and testes, where it guards

against cancer. The connection between carotenoids and the prevention of cancer and CAD has increased the value of fruits and vegetables in the human diet.

Vegetables and fruits that are high in lycopene have a cancer-preventing impact through reducing DNA damage and oxidative stress. One of the main carotenoids, lycopene is only present in certain fruits and vegetables, such as tomatoes, guava, pink grapefruit, watermelon, and papaya.

Because of its antioxidant properties, β -carotene protects against cancer and other disorders. The carotenoid with the highest antioxidant activity is β -carotene. Epsilon carotene has antioxidant activity that is 42–50% lower than that of alpha-carotene, which has 50–54% of β -antioxidant carotene's activity.

High cancer risk is linked to chronic inflammation. Immune suppression, a risk factor for cancer, and chronic inflammation are linked. One anti-inflammatory compound that targets several of the major actors in the inflammation-to-cancer chain is ginseng. The importance of phytochemicals with cancer-preventing capabilities has increased recently. Fruits and vegetables include chemopreventive elements that may have anticarcinogenic and antimutagenic properties in addition to other positive health effects. For the prevention of prostate and breast cancers, a wide variety of phyto-pharmaceuticals known as "phyto-estrogens" are advised.

Citrus fruit flavonoids are able to protect against cancer by acting as antioxidants. Soyfoods are a unique dietary source of isoflavones, the polyphenolic phytochemicals exemplified by epigallocatechin gallate from tea, curcumin from curry and soya isoflavones possess cancer chemopreventive properties. Soybean seems to offer protection against breast, uterine, lung, colorectal, and prostate cancers. β -carotene found in yellow, orange and green leafy vegetables and fruits such as tomatoes, lettuce, oranges, sweet potatoes, broccoli, cantaloupe, carrots, spinach, and winter squash has anticancer activity.

➤ Saponins	Saponins are thought to have antimutagenic and antitumor properties, which may reduce the risk of human cancer by halting the growth of cancer cells. Peas, soybeans, and other herbs with names that suggest foaming characteristics, such as soapberry, soapwort, and soapbark, contain compounds called saponins. Furthermore, they can be found in lucerne, potatoes, tomatoes, spinach and clover. <i>Yucca schidigera</i> and <i>Quillaja saponari</i> are the principal plants from which commercial saponins are derived.
➤ Tannins	Tannins also detoxify carcinogens and scavenge dangerous free radicals. Tannins are a known anticarcinogen used in complementary medicine and to prevent cancer. They are found in foods like grapes, lentils, tea, blackberries, blueberries, and cranberries. Ellagic acid, found in strawberries, cranberries, pomegranates, pecans, walnuts, and pecan seeds, is an anticancer substance.
➤ Pectin	It has been demonstrated that the soluble fibre pectin, which is present in apples, prevents prostate cancer spread by preventing the cancer cells' adhesion to other cells in the body. It has been demonstrated by numerous research that pectin lowers serum cholesterol levels. Derivatives of phenolic acid that exist naturally are said to have anticancer potential. There is evidence that phenolic substances such curcumin, gallic acids, ferulic, and caffeic acid have anticancer properties..
➤ Gluconolates	Low risk of colorectal and lung cancer has been linked to high intake of cruciferous vegetables, glucosinolates, and the hydrolysis products they produce, such as indoles and isothiocyanates. Dithiol thiones, isothiocyanates, and sulforaphane are examples of glucosinolates' bio-transformation products. In particular, they inhibit the enzymes that encourage the growth of tumours in the liver, colon, lung, breast, stomach, and oesophagus.
➤ Sulfur Compound	Garlic's sulphur components have been shown to strengthen the immune system, lower atherogenesis, platelet stickiness, and cancer risk. Broccoli is a potent phase 2 enzyme inducer due to its high sulforaphane content. D-glucarolactone, a potent breast cancer inhibitor, is produced by it. Sulforaphane is an antioxidant and an enzyme stimulant that helps the body cleanse itself. According to reports, sulforaphane lowers the incidence of breast and prostate cancer.
➤ Curcumin	The plant <i>Curcuma longa</i> , also known as turmeric, is the source of the polyphenol known as curcumin. According to reports, curcumin contains anti-inflammatory, anti-carcinogenic, and antioxidant properties. Consuming foods rich in cysteine, glutathione, selenium, vitamin E, vitamin C, lycopene, and other phytochemicals boosts the body's ability to fight oxidative damage. To ascertain their advantageous effects in the treatment or prevention of cancer, more research is required. Large-scale clinical trials indicate that various substances, including anti-inflammatory drugs, green tea, Vitamins D and E, selenium, lycopene, soy, and 5a-reductase inhibitors, are useful in preventing prostate cancer. (24)

Osteoarthritis:

The most prevalent type of arthritis in the United States, where it affects an estimated 21 million individuals, is osteoarthritis (OA), a crippling joint illness. All kinds of arthritis resulted in direct and indirect health care expenses of over 86 billion USD in 2004. (25) People with OA and other joint problems may have reduced physical activity due to joint pain, which can lead to an energy imbalance and weight gain. Increasing weight can make existing issues worse by putting more strain on the joints. Many people utilise glucosamine (GLN) and chondroitin sulphate (CS) to treat the symptoms of OA. These nutraceuticals appear to affect gene expression and the creation of NO and PGE2, which offers a plausible explanation for their anti-inflammatory characteristics. They also appear to have both nutritional and medicinal properties. (26)



Gastro Intestinal Disorders:

Reactive oxygen species (ROS) are produced in large quantities in the stomach, where their concentration is 1000 times more than in other tissues or plasma. The production of ROS aids in exogenous damage to the stomach mucosa, such as that caused by alcohol or nonsteroidal anti-inflammatory medications (NSAIDs). Furthermore, ROS are crucial in the multi-step process that results in the growth of stomach cancer.

It is recognised that naturally occurring anti-oxidants scavenge oxygen and nitrogen free radicals, halting the lipid chain peroxidation reaction, and have protective biochemical effects in a variety of biological experimental systems. Particularly widespread in vegetable diets and thought to be helpful in the protection of oxidative damage to living systems are phenolic chemicals.

Wormwood, dandelion, horseradish, chicory, and tarragon are some of the plants that have been reported to stimulate the digestive system. Wormwood (member of the Daisy family) should be used with caution since it may contain thujone, a tiny chemical that has been linked to convulsions,

hallucinations, and kidney failure. As a carminative, or a substance to reduce gas, cramps, and bloating, fennel is claimed to have these benefits. When used internally, aloe acts as a laxative.

Both gastritis and irritable bowel syndrome (IBS) have been treated with peppermint oil. There was a general improvement in the symptoms related to IBS in eight investigations, according to a meta-analysis of clinical trials using peppermint oil (*Mentha piperita*). Menthol is the oil's principal active ingredient.

The meta-authors analysis's identified a number of issues with earlier studies, particularly with the identification of IBS. Out of eight trials, only one correctly identified the condition. Among the eight studies, three did not specify their inclusion standards. The findings are therefore suspicious due to the quality of the trials, despite the fact that the overall result revealed that peppermint oil is helpful. In earlier investigations, peppermint oil acted as a calcium antagonist in both human and animal tests, according to the authors of this meta-analysis. The result of calcium antagonistic effects in the gut is gastrointestinal smooth muscle relaxation, potentially improving bowel rest. For peppermint oil to have gastrointestinal effects, it would likely need far too much to make food taste good. (27)

Irritable bowel syndrome :

In a subset of IBS patients, fibre can act as a bulking agent to enhance intestinal transit and reduce constipation. As a result, adding more fibre to the diet is frequently advised for IBS sufferers, particularly soluble fibres like psyllium or ispaghula husk rather than insoluble fibres like bran. Psyllium/ispaghula dosages should be gradually increased to prevent side effects including abdominal bloating and gas. Although the ideal amount of dietary and supplemental fibre for IBS has not yet been determined, aiming for 20 to 30 grammes daily is reasonable. Fiber as a therapy for IBS has conflicting scientific support. Based on a systematic evaluation of 12 trials, it was determined that there was no difference between soluble or insoluble bulking agents and placebo in terms of reducing abdominal discomfort, overall symptom scores, or global assessment scores.

Another meta-analysis of twelve trials indicated that fibre had a small but significant impact on symptoms (ispaghula husk). foods that cause gas Avoiding gas-producing meals made from fermentable substrates that are known to aggravate symptoms may also be beneficial for those with IBS. Alcohol, apricots, bagels, bananas, beans, Brussels sprouts, caffeine, carrots, celery, onions, pretzels, prunes, raisins, and wheat germ are among the foods that are linked to an increase in intestinal gas and flatulence.

FODMAPS stands for Fermentable Oligo, Di, and Monosaccharides and Polyols, which are commonly found in food and include fructans, galacto-oligosaccharides (Oligosaccharides), lactose (Disaccharide), and fructose (Monosaccharide), notably in excess of glucose, mannitol, sorbitol, and xylitol (Polyols). The short-chain carbohydrates that make up the FODMAP family are poorly absorbed in the intestine. Many foods contain FODMAPs, which are thought to affect the symptoms of IBS and other functional gastrointestinal illnesses. In the small intestine and colon, FODMAPS behave as osmotically active molecules. The FODMAPS are quickly fermented by the gut microbiota, producing hydrogen (H₂) and methane in the process. These gases affect the intestinal wall and raise intraluminal tension, which results in symptoms like stomach pain and bloating.

nutritional supplements The rhizome (turmeric) of the Indian herb *Curcuma longa* yields curcumin, a phytochemical and unprocessed member of the Zingiberaceae ginger family. In Ayurvedic and traditional Chinese medicine, curcumin has been used for generations to treat inflammatory conditions as well as stomach pain and bloating (e.g. biliary disorders, rheumatism, sinusitis, injuries and fever). (27)

CONCLUSION :

The usage of nutraceuticals is expanding quickly, and people are accepting of them because they are entirely natural. This interest is being sparked by the need for less synthetic drugs, which is also encouraging the business to create and market new goods with positive health claims. The absence of a uniform regulatory framework for nutraceuticals, which are frequently confused with other food-derived preparations, such as dietary supplements, poses a strong barrier. By recognising the uniqueness of nutraceuticals as pharmafoods and expressly recognising to them an added value in prevention and therapy, this gap should be closed. While nutraceuticals cannot completely replace medicines, they can be a powerful, highly effective tool for pathological disease therapy and prevention. A regulation is crucial to separating them clearly from medications and all other food-derived goods now on the market (such as functional foods, pre and probiotics, dietary supplements, and botanicals).

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