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Lycopene Use as a Nutraceutical, Which Can Treat Various Types of Disease and Nutraceutical Product Can Treat Many Diseases

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ABSTRACT

Lycopenes, are the carotenoid member, is one of the numerous tetraterpene compounds which is present mostly in tomato constituents. It was found to be an effective treatment for a number of conditions, including free radical illness treatment includes cancer, Type-II diabetes, cardiovascular disease, oxidative stress-mediated treatment, liver, brain, and reproductive problems, skin and bone diseases. This critique gives a general overview of the sources, biochemistry, uses, and potential applications of lycopene, as well as its potential to treat the disorders mentioned above. Nutraceuticals have drawn a lot of attention due to their expected safety as well as potential nutritional and therapeutic benefits. These took the place of modern drugs that raise dietary nutrient value, promote health, and lengthen lifespan. Nutraceuticals include dietary supplements, various nutrients, and herbs as key ingredients. These compounds lessen the pathophysiology of current illnesses and assist in averting the onset of future ones. They guarantee a higher standard of living in the end. This study seeks to address the most current findings in the nutraceutical sector, to facilitate the certain new and creative research ideas, scientific findings in this field.

INTRODUCTION

Nutraceuticals, which contain vital chemical components and nutritional supplements in specially prepared medical forms, are beneficial to human health. They are mostly employed to advance healthcare in the pharmaceutical industry. The word "nutraceutical" remained first used in 1989 by Doctor Stephen De Felice. They shows into "nutrition" and "pharmaceutical form" are combined to generate the term "nutraceutical," which also includes goods including food or a fraction of food, is good for human health and may be used to cure or prevent a range of illnesses. So, various diseases such as diabetes, heart disease, cancer, eye, skin, etc. it all treated by lycopene constituent. Food products contain substances that are beneficial to our health, offer us energy, and support various health benefits. The nutraceutical research and development industries are putting out their best effort to ascertain how different nutraceuticals may prove to be significant in the pharmaceutical sector. Standardization of ingredients, careful protocol development, and implementation of clinical studies are required by scientific requirements for nutraceuticals. These requirements will provide the groundwork for consumer health and have an impact on nutraceutical enterprises.

Too many types of formulations is quite thin; while the same chemicals may function as a food addition or nutraceutical, they may be distinguished differently based on claims. Nutraceuticals are foods that are specifically designed to support certain medical conditions, such as pro and pre-biotic meals, and solo or mixtures of Minerals, Vitamins, protein additions, and herbal items. Because nutraceutical increase or decrease the requirement for pathological diseases, including them into a normal diet may help avoid pathological disorders. There remain claims that certain foods, such as herbals and spices, may significantly improve one's quality of life and reduce the chance of developing certain diseases life[1] as like, several by regulating energy metabolic processes, neuro-oxidative stress, and neurological inflammation as well as promoting neurogenesis—an improvement in the number of non-proliferating cells, growth factors, and neurotrophins—via a variety of signalling pathways, studies have shown the neuroprotective effect of nutraceuticals—another medication without an adverse drug reaction—against a range of non-inflammatory diabetic disorders.

Lycopene

Lycopene is found in many fruits and one of the several carotenoids found in tomatoes and appears as a Red pigment. Additionally, lycopene lacks an aromatic ring and a B-ionone ring. It also doesn't because of its pro-vit-A action, beta-carotenes vary from other carotenes in terms of their biochemistry. Conversely, lycopene is found in food and other natural sources normally in an all-trans form, but it is also found in a human blood fluid in a cis form. tissue as a result of a double bond-related chemical reaction. This is less than naturally occurring lycopene. Because it has a more potent and stable singlet oxygen property than other carotenoids, lycopene is considered the best carotenoid. Lycopene has own unique antioxidant qualities, which may also be attributed to other mechanisms. In order to find more potentially relevant trials, we then manually reviewed the bibliographies and included trials. After that, the methodological quality of the research was examined, taking into account the effects of systemic medical disorders and the therapies associated with them.[2]

Health promotion of nutraceutical

The potential of nutraceuticals to offer health benefits is being investigated extensively due to their diverse bioactivities towards the human body. Several of these nutraceuticals' most significant bioactivities have been covered[3].

❖ **Some important Diseases treated with lycopene constituent in Nutraceuticals:**

1. Antioxidant

Antioxidant vitamins

Potential dietary supplements containing antioxidants have been used to treat chronic illnesses like cancer and cardiovascular disease. They mitigate the deleterious impact for the free radicals, thereby decreasing the oxidation of LDL cholesterol. Antioxidation vitamins are abundant in seafood, fruits, veggies, and fix oils. They function by either entrapping or stopping oxygen from produced by free radicals. Some epidemiologic studies of CHD patients who consume high levels of antioxidant-rich foods have shown that patients experience lower rates of morbidity and death. Vit-E and Vit-C antioxidant supplements, which can help in protection of CHFs. Conversely, adding ß-carotene supplements might have unusual side effect, hence it is never advised. In the National Health and Nutrition

Examination Survey-1 regiment trial, participants were randomly assigned to different combinations of 10 dietary supplements for the five years, revealing that vitamin C consumption lowers the occurrence of CHFs done a period of ten years ago in American men and women aged 24 to 75 years[4].

Lycopene oxidation in existence of heat, then oxygen, and then light due to autoxidation, lycopene undergoes autooxidation, yielding acetone, methyl-heptanone, and laevulinic aldehyde. It reacts to generate the colourless chemical glyoxal, which emits hay or grass-like Odors[5].

Antioxidant activity

Numerous nutraceutical had continued to shows that the ability to shift free radicals. Research suggests that a number of foods, including broccoli, spinach, parsley, garlic, onion, and grapes, possess important antioxidant benefits. Antioxidant-rich nutraceuticals help prevent Parkinson's and Alzheimer's disease, among other neurodegenerative illnesses. They inhibit the formation of oxidized LDL[6].

One well-known antioxidant is lycopene. It has the ability to shield lipids, proteins, and DNA from oxidation. Furthermore, "nitrogen dioxide, hydroxyl radicals, and hydrogen peroxide belong to the other free radicals that lycopene can act on the onset and development of acute pancreatitis (AP) are significantly influenced by inflammatory and oxidation stress. Lycopene (45-51 mg/kg) dramatically prevented Wister rats' plasma alpha-amylase and lipase activities, increased pancreatic glutathione (GSH), lowered NO levels, and downregulated the presence of INOS genes AP[47]. Fluorosis can trigger apoptosis in cells by initiating the MAPK cascade, which can lead to oxidative stress. The combination of Vit-E and lycopene prevented fluoride-induced spermatogenic cell apoptosis in rats. Both reduced the fluorosis-induced toxicity and enhanced the expression of rescued clustering purposes.

Furthermore, it lowered the phosphorylation of ERK and improved JNK[48]. Further examination displayed the function of lycopene by means of suppressing Proprotein convertase subtilisin /kexintype-9 expression is prolonged via increase Low-Density Lipoprotein-receptor and Cholesterol monitoring element-binding of protein-2, as well as decreased hepatocyte nuclear factor-1. Lycopene has to bind with lipoprotein lipase (LPL), in order to accumulate also decreases Apo-CIII. Similarly, lycopene lowered the expression of inflammatory agents and decreased plasma levels while also enhancing HDL-related PON-1

function and overall antioxidant activity in responses to LPS-induced oxidative stress[49]. Interestingly, in male rats with psychological issues, lycopene consume (45-50 mg/kg/day) improved d-galactose. Additionally, it enhanced hippocampal histo-pathological injury and elevated quantities of brains-derived neurotropic factors in mice's brain. Lycopene dramatically increased autoxidative enzyme action and decreased inflammation cytokines in serum of mice administered d-galactose. Moreover, lycopene supplementation boosts the antioxidant enzymes NQO-1 and HO-1's mRNA expressions.

Additionally, it was discovered to downregulate inflammatory cytokines in the mice's hippocampal regions, specifically TNF-alpha or IL-1 beta. Lycopene noticeably improves the GFAP and Iba-1 expression as the glial cells' inflammatory makers. By both activation Nr-f2 as deactivating NF-kb translocated in the H_2O_2-related SH-SY-5Y cells antioxidative of 2021 perfect, lycopene reduced neuronal oxidative damage. Furthermore, it distinctly reduce the concentrations of MDA, net sialic acid, DNA fragment such as improve the action of antioxidant enzyme in mice to prevent inflammatory bowel disease. Furthermore, lycopene much reduces to the pathological belongings of carbofuran on biochemical stress biomarkers and oxidation stress markers. Serum albumin, lipids, protein, and acetylcholinesterase were all significantly improved by it (15-19mg/kg). Moreover, it increased consumption of lycopene substantially improved the cognitive deficits, markedly reduced MDA levels as well as raised the GSH-P action and distinctly reduced tau the hyperphosphorylation at THr232/Ser236, Ser263, as well as Ser395 in the brains of P302L transgenic mice[50]. The results of the animal study demonstrated the lycopene drastically change ROS synthesis in SK-Hep-2 cells though reducing NADP-H oxidase, which at first was performed by the proteins C (PKC) pathway's, were obtained oral lycopene dosages of 10-100 mg per kg.

Then, it was discovered the lycopene constituent effectively prevented hepato-toxicity it's functioning such as antioxidative, controlling the levels of CAT and total decreasing glutathione disulfide, lowering glutathione (tGSH), and reducing carbonylation of proteins to minimize oxidation injury. Furthermore, it boosted the down-guideline of MMP-2. The intracellular quantities of NF-κB activity, mitochondrial ROS, niching expression, and the instruction of calcineurin 1 were all decreased by lycopene; in cells overexpressing RCAN1, it also decreased MMP, glycolytic activity, and respiration per mitochondrion. It suppressed DNA fragmentation, cytochrome-c release, cell death, and caspase-3 activation in RCAN1-overexpressing cell lines. Moreover, prior research showed the lycopene (10 mg/kg)

enhanced the expression of the GP_X is SOD, while lowering the functions of the caspase-3, 9, and BA_X genes, which attenuate the toxicity of fluoride. The movement, viability, and antioxidant capability of spermatozoa were all decreased by the administration of ferrous ascorbate[51]. But when lycopene was administered, it stopped these alterations in male reproductive cells and showed potent antioxidation and ROS-scavenging properties.

Because mitochondria produce less superoxide and ROS within the cell, it can also lessen oxidative stress brought on by Aβ. Furthermore, it demonstrated enhanced morphological changes associated with Aβ in the mitochondria, including the release of mitochondrial change pores opening in conjunction with cytochrome -C. Furthermore, it has been demonstrated that lycopene helped treated neurons with Aβ recover their ATP and enhance their mitochondrial complex activity. Furthermore, lycopene raised transcription Factor-A and dramatically decreased DNA injury levels in mitochondria, according the in-vivo studies[7] e. g. below the lycopene's antioxidant properties in the liver organ figure 1.

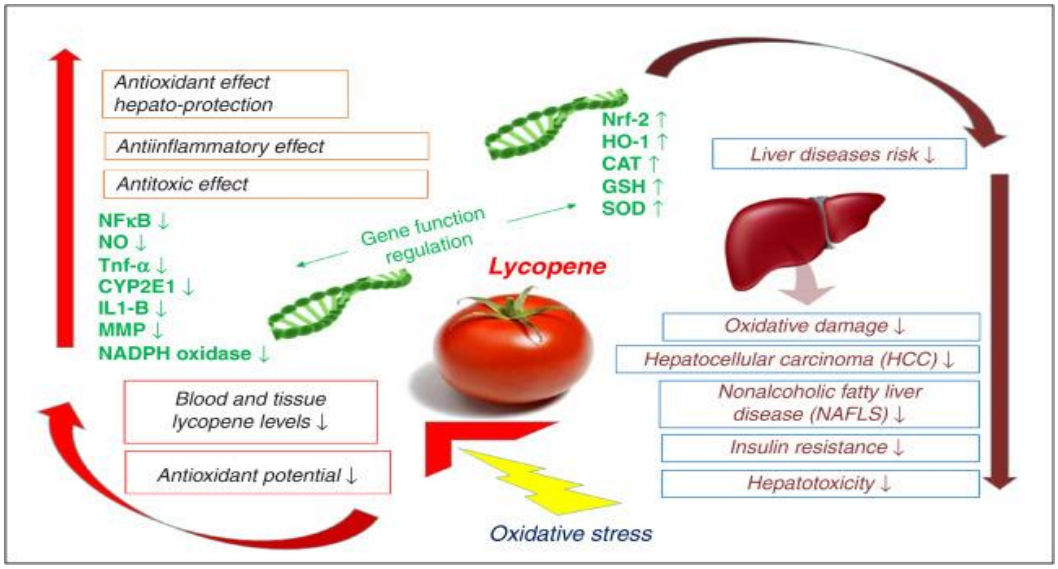

Figure 1. The defending role of lycopene counter to oxidation stress in liver and hepatotoxicity.

2. Cardiovascular Disease can be treated by Lycopene:

Globally, CVDs are the primary cause of both mortality and illness. Smoking, several major indicators of risk for heart disease including High BP, high saturated fatty acid, and both. Bloodshed flow is impeded by blood vessel damage and block, our heart related

cardiovascular diseases (CVDs) most often, in atherosclerosis. The highest rates of CVDs are found in Europe and the United States when compared to Mediterranean countries. Heart disease (CVD) rates have been found to be lower with diets rich in veggies, including tomato products and its derivatives, and olive oil. Conversely, low blood levels of lycopene have been linked to atherosclerosis, myocardial infarction, hypertension, and stroke. Elevations of lycopene within blood has been shown to decrease the risk of chronic heart problem. Lycopene's potential as a CVD preventive is strongly supported by epidemiological research. Poor outcomes from cardiovascular disease and all-cause mortality have been associated with low blood lycopene levels. It has been demonstrated that lycopene supplements increase plasma lycopene concentrations, decrease indices of oxidative damage, and finally improve antioxidation performance.

Other consequences of oxidative stress include decreased NO production, endothelium impairment, increased mRNA degradation rate, neurodegenerative diseases, blood vessel damage, and diabetes[9,10]. Therefore, in the current state of biomedical research, natural or synthetic molecules, which can prevent the AGE and RAGE development or interactions are nearly important. Lycopene has been shown in studies to decrease Production of AGE and RAGE, which can be assist to protect vessel. Preclinical research suggests supplements containing lycopene may enhance the function of endothelial cells. Because lycopene has antioxidant qualities, it may boost the availability of NO, control vasodilation through the endothelium, reduce damage to proteins, lipids, and DNA, as well as improve mitochondrial activity[11,12]. Clinical studies revealed that lycopene and tomato-based goods decreased total cholesterol as well low-density LC (LDL-c). In well postmenopausal women, carotenoids supplement can reduce total and LDL cholesterol. Whenever rats were given lycopene dietary supplements, their levels of HDL and LDL significantly increased and decreased, respectively., triglycerides, and total cholesterol. Additionally, it has been reported that lycopene-supplemented rats and hamsters showed a significant decrease in oxidized LDL and TG, respectively. Following a year, the treatment of 15-20 mg of lycopene and lutein reduced IMT, with the combination proving to be more beneficial than lutein alone[13].

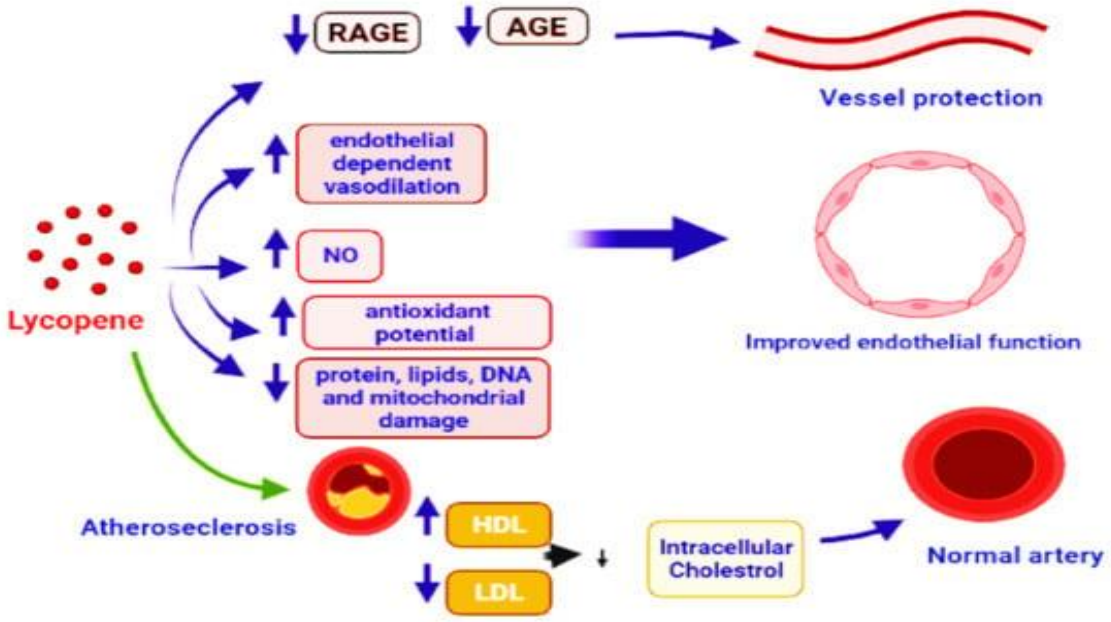

Figure 2 - Application of lycopene, which inhibited creation of (AGE) and (RAGE).

3. Coronary Artery Diseases (CAD) and Lycopene

Among the leading causes of death ways coronary artery disease (CAD) takes responsibility to over 18 million of die annually. The most common CVD is cardiovascular disease, practically the epidermic proportion of various Society's. It a long-term inflammatory condition takes place remodelling of the coronary arteries as a result of internal passage narrowing and vascular hardening from plaque buildup[14,15]. Apart from the previously mentioned factors, the reduction in blood flow to the heart muscles due to the availability of nourishment and oxygen is further reduced by the stimulation of platelet and inflammation substances, especially during periods of severe exercise. Low-density lipoproteins and pro-inflammatory agent accumulation in coronary arteries as a silent poison, progressive process known as atherosclerosis.

Because oxidizing Low-Density Lipoprotein Cholesterol (LDL-C) activates and differentiates monocytes into macrophages, it is the primary cause of atherosclerosis and consequently CAD. When macrophages and low-density lipoprotein (LDL-C) interact, interleukins, cytokines, and tumour necrosis factors (TNF) are activated[16, 17]. Collagen types I and III combined with an intact smooth muscle cell cap make up stable plaque. This kind of plaque causes ischemia, stenosis, and decreased blood flow[18]. A small number of smooth muscle

cells and type I collagen make up to the 2nd type of the sign, known as thin, susceptible signs.

Nonetheless, it has a significant number of macrophages, prothrombotic molecules, and proinflammatory molecules. They do the blood coagulation proteins may related to another, resulting in thrombus and a heart mild coronary disorder. Tachycardia, ischemia of the myocardium, and dysfunction of the left ventricle are all symptoms of cardiac failure can all result from chronic CAD[19]. Prominent such factors like coronary heart disease (CHD) such as age, male genders, low HDL-c, elevated LDL-c, Diabetic Mellites, Cigarettes Smoking, and Genetics. Metabolic disorders and obesity are also regarded as CAD risk factors.

Both VSMCs and foam cells displayed anti-atherosclerotic properties. Properties, are promoted by lycopene. During the process of atherosclerosis, VSMCs that are contractile differentiate in proliferating along with migrating cells, which are enable them to enter into the outer cellular matrix contributes to the formation of plaque by producing inside. Lycopene works against G1 phase cells, not against matrix metallo-proteinase, to keep them from progressing to the S-phase of cell sequences.

Additionally, it remained discovered that slightly oxidized LDL-C can alter the phenotypic of VSMC; lycopene may prevent the formation of oxidized LDL in order to halt this process[20, 21]. It was found that VSMC proliferation and migration were inhibited by PDGF functions by direct binding, inhibiting platelet-derived growth factor signalling, before acting by way of Antioxidant by way of responsive oxygen species accelerate the change between contractile toward artificial phenol type.

Then, lycopene inhibits the upregulation p53 and the capase-3 in mRNA, which was turn stops endothelial tissues cell from going through the programmed cell death. It also stops expression of toll such receptors-4 as well as the cluster to differentiation 14 (CD14) in the endothelium membrane. It is believed that circulating plasma lycopene prevents atherosclerosis are mentioned in (Figure 2).

A brief treatment within eight weeks, a patient with hypertension can reduce their blood pressure by taking 200-250 mg of antioxidation rich tomato extraction daily. They study to found an inverse relationship between the risk factor for the CVD, carotid artery intima-media thickness, and lycopene consumption[13].

4. Hypertension treated by lycopene

A person is diagnosed with Systemic Arterial Hypertension (HT), also refers as High BP, when the Diastolic BP they have more than the 85-95 mmHg or Systolic BP was greater than 135-145 mm Hg. Silent killer which continues the 3rd greatest cause of death from cardiovascular disease is assisted by smoking as well as LDL cholesterols. Kidney failure and stroke are two major risks that are increased by hypertension. The inflammatory process and oxidative stress are linked to hypertension[22, 23]. Kidney failure, left ventricular hypertrophy, stroke, retinopathy, and Peripheral VD can all be brought on by chronic hypertension.

Hypertension has a very complicated and multifactorial pathophysiology. One view, as presented in certain research reports, holds oxidation stress which plays a vital role in hypertension development. By reducing nitric oxide (NO), oxidative stress alters the composition and functionality of blood vessels. This leads to endothelial dysfunction as well as Hypertension is caused by vascular cells movement, production, and death. The BP lowering actions NOX inhibitor, Antioxidation, and ROS scavengers as a part of oxidative disturbance in hypertension pathogenic. Renin -Angiotensin System (RAS) are available, aim for the antihypertensive medications, and contribute as a significantly to the pathophysiology of hypertension[24].

The kidneys' juxtaglomerular cells produce the enzyme renin, which catalyses the initial stage of the conversion of becomes angiotensin-I from the angiotensinogen. Liver production produces angiotensin, which is precursor of angiotensinogen. Then lungs produce the majority of Angiotensin Converting Enzyme (ACE), they responses for converted angiotensin-I convert in the angiotensin-II by the renin.

Angiotensin-II then interacts with related receptors to create a variety of biological molecules, such as aldosterone, potent agents for Vaso restriction, and antidiuretic hormone (ADH) through the pituitary, adrenal, and cells of smooth muscles in the arteries. Each of those changes occurs may resulted in the kidneys reabsorbing water and salt, a decrease in urine production, blood vessel narrowing, and the subsequent onset of hypertension[25] (figure 3).

By decreasing the Oxidation Stress that may cause increasing the Nitric Oxide (NO) generation within the endothelium, lycopene lowers blood pressure and functions as an antioxidant. 54 patients with moderate hypertension who were already taking the following

treatment, both the diastolic as well as systolic blood pressure significantly decrease with Angiotensin Converting Enzyme or Ca^{2+} channel blockers the taking tomato extract supplements for six weeks[26].

This recommendation that the lycopene play a role in managing hypertension to prevent heart disease. Supplementing with lycopene (above 12 mg/day) was found in a meta-analysis to reduce Persons experiencing hypertension's systolic blood pressure is elevated as well as prehypertension, but not Diastolic Blood pressure. Lycopene inhibits the ACE, which can obstruct angiotensin-II.

Because of its antioxidants such as anti-inflammatory capabilities, carotenoid supplements prevent the variations of hemo-dynamic parameter available, that are biochemical substances and inflammatory marker, and genetic modifications, such as decreased the amount of Myocardial Infraction. 299 Korean males saw a substantial drop in blood pressure after an 8-week duration 14-20 mg/day lycopene (Fig-3)[13].

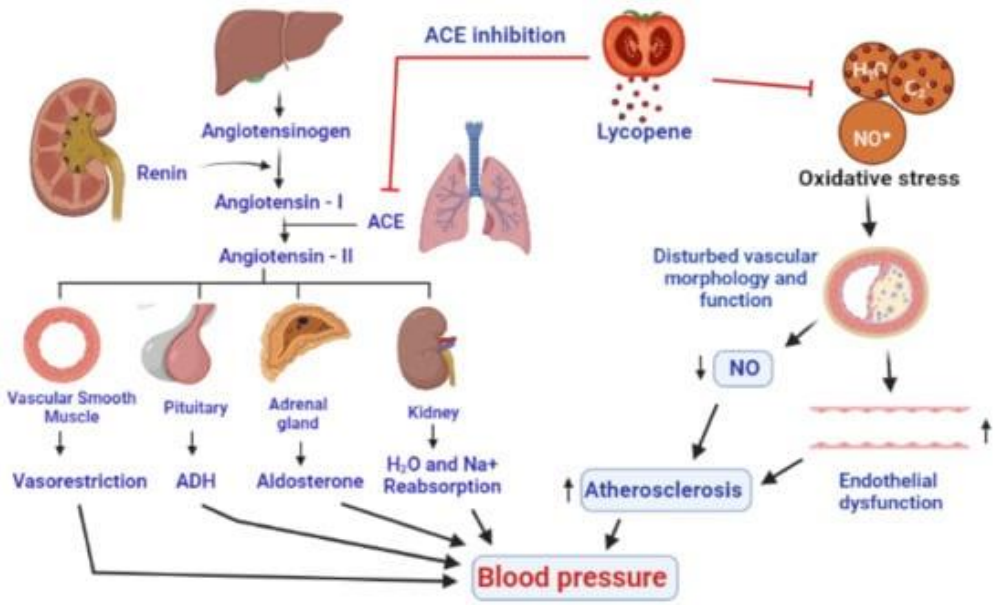

Figure 3: The antihypertensive benefits of lycopene are exemplified by its antioxidant properties and suppression of ACE.

5. Diabetic Patient treated with Lycopene

Ninety percent of cases of diabetes are 2nd type diabetes mellitus, which was worldwide community well-being emergency help. According to estimates from International According

to the International Diabetes Federation (IDF), 4.1-4.3 million publics death from diabetics related causes in 2019, and a total of 464 million adults who was affected on worldwide are estimated to have diabetes[28]. Type-II diabetes mellitus metabolism disorder marked via decreased insulin secretion due to malfunctioning β-cells in the pancreas and peripheral insulin resistance. It primarily affects older adults, but it's more widespread in kids, teens, and young people these days due to rapid growth, bad nutrition, and rising sedentary lifestyles. In the early stages, T2-DM are typically asymptomatic and can be untreated for years. Undiagnosed and less controlled glucose levels have been related to potentially fatal consequences like cardiovascular disease, neuropathy, nephropathy, and retinopathy.

In addition to having a substantial negative influence on health, diabetes large financial effect on nations and their Health system because of need for long-term care for problems associated to the disease, higher utilization of medical services, and misplaced output then counter the several risk factors have been identify as a contributing to the formation of T2DM. Altogether with genetic and behavioural variables, oxidative stress in the pathophysiology of type 2 diabetes and its consequences in epidemiologic as well as previously conducted.

As type 2 diabetes progresses, lifestyle modifications including regular exercise and a nutritious diet are necessary in addition to medication[29]. The antioxidants are necessary for vitamin to guard against oxidative cell damage, which is significantly consideration due to the rising occurrence of diabetic throughout the world. Assumed the possibility for a range of adverse effects with synthetic antihyperglycemic medicines and pharmaceuticals, multiple studies have revealed that bio-active substances obtained from plant-based meals can assist to enhance diabetes and associated consequences. Researchers want to look into lycopene's potential as a supplemental anti-diabetic treatment are interested because of its strong antioxidant qualities. Lycopene is a potent Lipophilic carotene that is mostly found in tomatoes.

Antioxidative properties characteristics of lycopene have been ascribed the situation extensively saturated bonds with conjugation, with the existence either acyclic otherwise cyclic ending groups exerting a marginal impact. Numerous investigations have established a connection between lycopene and oxidation stress caused by diabetes by assessing multiple biological markers as well as products of lipid peroxidation in plasma or tissue samples. These products include malondialdehyde, super oxide dismutase, and glutathione peroxidase,

which are endogenous antioxidants. Although experimental data confirming the therapeutic benefits of lycopene in diabetes recently has been discovered, in the fundamental molecular based of mode of action remain unknown. Numerous factors, including as absorption, bioavailability, and in-vivo metabolic reactions, have the potential to alter its biological effects. As a consequence, this evaluation examines (i) the characteristics as well as mode of actions of lycopene such as strong antioxidant in the treatment of T2DM, and (iii) the research on lycopene impacts on glycaemic control as well as oxidation stress biological markers in T2DM.[27].

Mechanism

Lycopene has been shown in animal experiments, and epidemiological studies to reduce in T2DM, oxidation injury can be reduced by searching oxidise molecules and enhancing antioxidative catalytic action. Life-threatening ROS generation has been postulated to downregulate antioxidative defence pathways, leading to oxidation inequality. Consequently, lycopene administration may reduce MDA levels in diabetes, kidneys, pancreatic tissues, and ovarian tissues injured by furan, while increasing the production of CAT, SOD, as well as GPX[33]. An alternative research reports that lycopene decreases oxidative stress in diabetic rats. Liver by cumulative the amounts of CAT and non-protein sulfhydryl groups, while likewise reducing blood OX-LDL as well as liver thiobarbituric acids reactive compounds. Furthermore, oxidative stress-induced PI3K/Akt (phosphatidylinositol-3-kinase/AKT) signalling has been related to contact of AGE as well as their receptors, RAGE.

It should be demonstrated that lycopene constituent (15-20 mg/day with weight) treatment aimed at eight dose Weeks increases Akt phosphorylation in diabetic kidney tissue[32]. Similar to this, a 5-week lycopene supplementation of 10 mg/kg/d slowed the AGE formation induced by ribose the HK_2 cells as well as rat kidneys RAGE expressed as preventing diabetes therapy of kidneys. Furthermore, research demonstrated that the quantity of endothelial progenitor cells (EPCs) and vascular endothelial dysfunction are significant serious issue for in emergence case in vessels problems contain in type 2 diabetes. The Zeng group[34].

It is important to note that lycopene can prevent obesity in people with type 2 diabetes and maintain glycaemic control in addition to raising peripheral antioxidant capacity. Chronic hyperglycaemia and insulin resistance may result in abnormalities related to the use of

glucose, which can then lead to an excessive build-up of fats and free fatty acids in the blood. It has been shown that lycopene administration controls the Glycated Lower-Density Lipoprotein, G-Hb, and FBG levels in diabetic rats in order to decrease the metabolic reactions of glycolipid.

It had remained demonstrated that lycopene enhances glucose metabolism by lowering Ox-LDL, which in turn lowers the incidence of lipid peroxidation reaction and autonomic oxidation of glucose[33]. Accordingly in diabetic renal tissues, lycopene functions serving as well as a Lipid-Lowering Drug that concurrently increases high density lipoprotein cholesterol levels or high-density lipoprotein cholesterol, and significantly reduce triglycerides, total cholesterol, and lower-density lipoprotein cholesterol.

Finally, it has been observed the loss of insulin-secreting cells such as vacuolization within the islets of the Langerhans's cells are reduced by lycopene therapy, which lowers the blood glucose levels in diabetic rats[27].

Lycopene Status in Type II Diabetes Mellitus Patients

Previous researchers have extensively studied T2-DM patient from diverse groups were tested for lycopene status. Cross-section investigation research employing 24-hour food recall was used to determine the lycopene level of 23,378 Korean individuals (18-75 years). Non-T2-DM males consumed considerably more dietary lycopene then T2-DM man, according to the findings. T2-DM patients ingested considerably less lycopene than phase match well controls in a case-control study. The individuals in the research had either proliferative diabetes-related retinopathy before non-flourished diabetes.

Then finding remains consistent with the findings of a public-based cross section investigation conducted in an Australia, was discovered knowingly inferior levels of lycopene among the T2-DM retinopathy group[30,31]. Additionally, persons in the United States of America (US) with recently diagnosed Type 2 Diabetes had far fewer levels of lycopene compared to those in the US with inadequate glycaemic controls, according to research by Ford et al. When compared with healthy controls, extremely elderly individuals with T2DM (mean age 75.7 0.8 years) had considerably lower plasma lycopene concentrations, according to different research examining the lycopene status in Type 2 diabetes. patients in Germany.

Some other disease treated with Nutraceuticals Products:

1. Gastro Intestinal Health

An estimated 41 million Americans are afflicted with a range of digestive disorders, including but not limited to diverticulitis, ulcerative colitis, food allergy, Crohn's disease, and gastro-oesophageal refluxing disease. Polysaccharides which have naturally prebiotics it has own healing process as well as the prevention of disease. Nutraceuticals have the power to lessen oxidative and antigenic insults to a person's digestive system. Polyphenols and flavonoids have antioxidant activity are supposed to be gastroprotective and cytoprotective agents.

The neurotransmitter called glutamate is existing in a gut then show a vital part to Development of baby's stomach mucosa as well as improving newborn gastrointestinal function and gastric emptying[35, 36]. Probiotics and other herbal nutraceuticals have a special function in maintaining a Healthy Digestive System. They support the natural body defences against harmful bacteria, promote growth of beneficial gut microflora, and slow their growth. It can avoid GI tract issues and lessen lactose intolerance. offer advantages to health[37].

2. Kidney and excretion health

Certain promoters like potassium citrate, lutein, lycopene, Pygeum, pine barks of IP-6, Lutein, Lycopene, and zeaxanthin played an important function in our digestive system. But there are the following: fostering appropriate urinary oxalate excretion; offering kidney protection; enhancing the condition, regulating calcium buildup; preventing oxalate crystal formation; and preserving natural microbial flora in urinary tract. [38, 39]

3. Reproductive health

Nutraceuticals have a major impact on the ability of both men and women to reproduce. Nutraceutical food supplements improve sperm quality, treat sperm dysfunction, enhance sperm count by 61%, and increase the sperm motility by three times. They also control male infertility. Additionally, it shields the sperm from oxidative damage[38, 39]. For females, it influences cellular steroid output and lesser the risk a pre-term labour in a human. The nutrients ubiquinone's Q 10, vitamin B6-B12, flax oil, and Fish liver oil lesson oocyte harm which Fallopian tubes as well as promote the development of the embryo. Consuming a balanced diet that includes nutraceuticals lessens women's monthly suffering. The majority of

menstrual disorders are brought on by dietary deficiencies that result in incorrect sex hormone metabolism. Certain nutraceuticals may have an impact on ovarian pathology, hormones, and reproduction.

4. Osteo- Arthritis

Osteoarthritis, a complex disease here ethology includes bio-chemical and mechanical factors, which together work to destroy cartilages, affects all joint tissues. Joint discomfort prevents people from exercising, which causes an energy disproportion too weight gains. Nutraceuticals like, the bananas, the ginger, tea with greens, the plant like oxaceprol, then Boswellia, the willow tree, the curcumin constituent, the soya-beans, then avocado, and the collagen fibre are used to the cause problems. Apart from their typical function as a nutrient, they also possess pharmacological effects and are important within the control of expression of genes.

They have demonstrated that effectiveness of using nutraceutical antioxidant compounds for treating inflammation, pain, and degeneration of joints. Supplementing with glucosamine as well as Chondroitin Sulphate may help to prevent joint constriction and arthritis-related discomfort. Using olive oil on the knees also helps to reduce swelling and discomfort and enhances their physical function. Omega-3, canola oils, psyllium, oats, bran, lignin, and prebiotics examples of highly effective functional foods[40, 41].

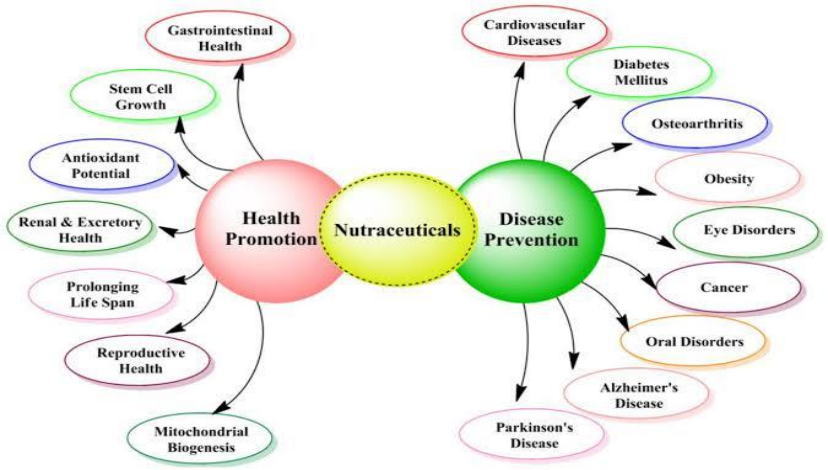

Figure 4. Nutraceutical having role various type of disease which are treated shown in above figure.

5. Oral related diseases

The word "ordontonutraceuticals," which refers to phyto-therapeutic substances that alter several molecular along with metabolic targets, has recently been recognized. Because they are bioactive, such phytochemicals preventing disease of the mouth. It could be very important in complex, multifactorial oral disorders. It contains extracts from cocoa seeds, grapes, and green tea they contain high proanthocyanins, carotenoids, as well as polyphenols. Aloe-gels relief oral lichen planus patients pain and promotes the healing of mucosal wounds. Additionally beneficial to the prevention or inhibition of periodontitis, gingivitis, dental caries, halitosis, etc., are probiotics[42].

6. Alzheimer disease

Neurocognitive disorder is an alternative term used for Sterile dementia. The antioxidation appearance, for long course of sickness. Making use of their powerful antioxidant capabilities, substances including curcumin, lycopene, β-carotene, and lavender help prevent neuronal damage caused by oxidative stress. These substances have the capacity to postpone dementia's onset[43]. Numerous studies shows that taking vitamin supplements, such as the Homocysteine concentrations are lower the nutrient folic acid as well as B12 and delays the onset of disease.

7. Parkinson disease

The hallmark of Parkinson's disease is neurodegeneration, and particularly impairs dopamine related cells in the brain. These age-related factors is one of the most common in the globe. Research has demonstrated the preventive benefits of unsaturated fatty-acids, coenzyme Q10, plant poly-phenols, stilbenes, soy as well as other Phyto-oestrogen, and vitamins C, D, and E against the advancement the Parkinson disease (PD). Natural herbal nutritional (Brahmi) was naturally produced tonics of brain, which can help for circulation of blood in brain, secretion of hormones, brain cell regeneration, mental peace, relaxation, migraines, insomnia, and depression[44]. Researchers have also employed a nutritional product inosine, a precursor of nicotinamide, to bring slow the progression of Parkinson disease[45].

8. Eye Disorder

A diet high in nutraceuticals may be helpful in treating Macular degeneration caused by aging. Cataract as well as presbyopia's are affected by the antioxidant qualities of a substance called DHA, tea with green flavonoids, vit-E, and co-enzyme. Glaucoma and other vision problems are treated with zeaxanthin. Furthermore, co-enzyme Q-10, Melatonin, along with soybeans, which can manage muscular degeneration. Flavonoids, the vitamin-C, carotenoids and toco-phenol, Caffeine, as well as Pyruvate are effective against retinitis pigmentosa[46]. in zeaxanthin and lutein, which improve eyesight as well as reduce the possibility of cataracts formation, the bran of rice, fruits, as well as veggies are excellent sources of these compounds. Folic and essential fatty acid (omega-3, 6, 9) and the brain[6].

Conclusion

The nutraceutical industry has various different use. India's nutraceuticals market is one of the fastest-growing in the world. Some nutraceutical chemical constituent are play an important on the health benefits and promote patient health. Consumers in the high and middle classes view nutraceuticals as a side effect-free alternative to prescription medications and just for their health benefits. Nutraceuticals are gaining popularity among consumers who want to increase their energy levels, increase their physical and mental stamina, and improve their attentiveness. The nutraceutical businesses are concentrating on creating a new goods, creative formulas and using effective advertising to help consumers select the appropriate items. It hold great potential for enhancing human well-being and averting illnesses. All age groups embrace them widely because of their superior quality, safety, efficacy, and ability to promote both disease prevention and health.

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