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Nutraceuticals in cardiovascular diseases

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Abstract
Cardiovascular disease (CVD) line up as the most common health related and economic issues worldwide. Cardiovascular disease is a complex and multifactorial disease and is characterized by multiple factors. Dietary factors are important contributors to cardiovascular risk, either directly, or through their effects on other cardiovascular risk factors including hypertension, dyslipidemia etc. Nutraceuticals are natural nutritional compounds that play a vital role in maintaining well-being, enhancing health, modulating immunity and thereby preventing as well as treating specific diseases. Physicians today have an arsenal of medications and different therapies including chemotherapy that they can prescribe to treat Patients of CVD, but are truly expensive and are prone to many side effects. Hence nutraceuticals can be a Great help in clinical therapy as they have the ability to significantly reduce the risk of side effects associated with chemotherapy along with reduction in the global health care cost. The purpose of this review is to present an update on the benefits and use of nutraceuticals in relation to the development, prevention, treatment and progression of cardiovascular diseases.

Keywords: cardiovascular diseases, neutraceutical, treatment, garlic, turmeric, capsicum, tomato

Introduction

Nutraceutical: The term 'nutraceutical' is characterized as a food stuff (a strengthened food or dietary enhancement) that gives medicinal advantages not withstanding its essential wholesome value. In 1989, Dr. Stephen De Felice instituted the expression “Nutraceutical” from the words nourishment and pharmaceutical and characterized it as food (a piece of food) that gives clinical ir medical advantages, including the counteraction or potential treatment of a malady [1].

Nutraceuticals may go from segregated supplements, dietary enhancements and doets to hereditaraly built fashioner nourishments, home grown items and handled item, for example, oats, soups and drinks. A large number of these items cobtain relevant physiological capacities and important natural exercises [2].

All over history, from the hour of human advancement, the socialized social orders had a profound enthusiasm for, and worry about, the honesty of food flexibly. Sometime befire the improvement of logical order if susteinance, logicians and numerous late doctors gave significance and sharp consideration to the job of the day by day diet in individual and general well-being. During th most recent 2000 years, from the time of Hippocrates (460-377BC) to the beginning of current medication, there was minute qualification made among food and medication. Hippocrates perceived the fundamental connection among food and well-being and underscored that “distinctions of illness relay upon nutriment”. After such large amount of study and work of numerous scientists, Galen (132-201promotion), a doctor, reflected trust in the information and capacitiesnof doctors to set up great eating regimens that would profit and advance general well-being [2].

High convictions in the impacts of ailments (food, susteinance) upon well-being and illness seem, by all accounts, to be founded on emchanted considering food, bu utilising the ' like makes like' rule the chemist sought after their quest for “solution vitae”. One of the replacements of chemist, Casimir Funk, by utilising a similar idea found a nitrogen- containing amine-base in the shell of a rice grain, since he believed that the substance is ' life basic' for individuals, he characterized the phrase “nutrient” from vitae-life and amine. He likewise accessed on a few food related maladies and recommended that the non-appearance of “nutrients” caused those infections [2].

The current information on gainful impacts of Neutraceuticals will undoubtedly effect nourishment treatment. At present, Neutraceuticals speak to the quickest developing portion of the present food industry. The current collected information about nutrceuticals spek to a more prominent test for nutritionists, doctors and food technologists and food physicists [2]

Cardiovascular Diseases:

Cardiovascular disease (CVD) is common and seen in majority in grown-ups above 60 years of age. As per information from 2012 & 2013, it has been estimated that CVD is responsible for about 17.3 million deaths annually worldwide [3].

According to World Health Organization (WHO), the cause of growing mortality rate worldwide is ischemic heart disease. Heart failure, the inability of the heart to pump the blood and deliver oxygen and nutrients to cells, leads to a large number of dysfunction. Few to be mentioned are Hypertension, Inflammation, Hypertrophy, Atherosclerosis, Ischemia and disturbance in the electrical activity of the heart, expressed primarily by Arrhythmia. All these conditions are related to each other. Reduced ejection fraction is usually accompanied by two or more chronic conditions. Angina, pain in the chest due to lack of required blood flow to a portion of the heart muscle, in many cases,

is an early warning sign. Chemotherapy's side effects in many cases results in heart failure [4].

In different parts of the world, there is a definite connection between diet and the occurrence of heart disease. Fir example, where a Mediterranean diet is the usual staple, occurrence of heart disease is considerably lower than where red meat consumption is high. Habitual red wine drinkers are also protected. In the Far East, green tea also correlates with lower cholesterol and heart disease. Nutraceuticals in the diet plan play an important role in the prevention and treatment of heart disease [4].

Causes/Risk Factors

Table 1

Category	Examples
Non-modifiable risk factors	Advancing age Male gender Family history/genotype
Metabolic risk factors	Hypertension Hyperlipidemia
	Diabetes mellitus Metabolic syndrome Obesity/overweight
Lifestyle risk factors	Diet Smoking Physical activity
Novel risk factors	dElevated homocysteine level Elevated lipoprotein (a) level Small dense LDL-C Elevated inflammatory markers levels Elevated hemostatic factors levels

(5)

Reduction of risk factors in the population, especially reduction in blood pressure and lipid lowering can have large impacts upon mortililty due to CVD [3].

Common signs and symptoms of cardiovascular disease

The following symptoms are associated with heart disease:

1. Chest pain
2. Palpitations
3. Shortness of breath
4. Fainting
5. Leg swelling

- Chest pain is the central symptom in angina and heart attack. Frequently, its features are typical enough to allow presumptive diagnosiveness before more specialized tests are performed.
- Palpitation are very common cardiac symptom, and are usually associated with rhythm distribution. Although palpitation may be perceived as very unpleasant and cause anxiety, they are not necessarily associated with a significant heart disease.
- Shortness of may be the main cardiac symptom in some patients, but its subjective nature and presence in many conditions as well may render the diagnosis difficulty.(6)

Cardiac Dysfunction

Features of Cardiac Diseases

It originates from the cellular stress. Remodeling compensates for hemodynamic changes that the system implements to sustain cardiac output. This may also result in dysregulation of miRNA expressions, which function as biomarkers and give timely and tissue specific information on the state of the cardiac system [7].

Cardiac dysfunction otherwise known as cardiovascular breakdown is a clinical condition brought about b basic and practical deformities in myocardium bringing about debilitation of ventricular filling or the launch of blood. The most well-known reason for cardiac dysfunction is diminished left ventricular myocardial capacity, anyway dysfunction of the pericardium, myocardium, endocardium, heart valves in heart vessels alone or in blend is likewise connected with cardiac dysfunction. A portion of the major pathogenic system prompting cardiovascular breakdown are expanded hemodynamic over-burden, ischemia-related dysfunction, ventricular rebuilding, inordinate neuro humoral stimulation, abnormal myocyte calcium cycling, exorbitant or lacking multiplcation of the extracellular network, quickened apoptosis and hereditary transformations. Cardiac dysfunction is in reality an intricate disease thus far has been a significant reason for morbidity and mortility in creating and created nations [35].

Signs and Symptoms

- Shortness of breath (dyspnea) when you exert yourself or when you lie down
- Fatigue and weakness
- Swelling (edema) in your legs, ankles and feet
- Rapid or irregular heartbeat
- Reduced ability to exercise
- Swelling of your abdomen (ascites)
- Very rapid weight gain from fluid retention
- Lack of appetite and nausea [8]

Hypertension

Hypertension has regularly been portrayed as the quite executioner. Over 20% of Americans are hypertensive and in light of the fact that many are asymptomatic, they are uninformed if what might be the underlying period of building up a cardiovascular disease. Inspite of the fact that manifestations are generally missing, percevieringly raised circulatory strain causes long haul harm yo various organs and can rrsult in over cardiovascular infection, constant kidney harm and stroke and is an incessant reason for suddden passing. Hypertension is a significant modifiable hazard factor for cardiovascular ailments [9]. It has been demonstrated that bringing down circulatory strain lessens cardiovascular hazard by 20-25% for myocardial infarction, 35-40% for stroke and about half for cardiovascular breakdown [3].

Signs and Symptoms

- Severe headache
- Fatigue or confusion
- Vision problems
- Chest pain
- Difficulty breathing
- Irregular heartbeat
- Blood in the urine
- Pounding in your chest, neck, or ears(10)

Coronary artery Disease (CSD) – Atherosclerosis

Coronary artery disease occurs when the coronary conduits become excessively limited. The coronary veins are the veins that supply oxygen and blood to the heart muscle. Coronary heart disease stays one of the main sources of death in US representing around 17% overall health care expenditures. Coronary illness is the accural of plaque in the

arteries of heart that supply blood for keeping up ordinary Cardiovascular functions. The absence of oxygen rich blood to segment of the heart muscle prompts ischemia of myocardial tissues and subsequent alteration of heart function. Atherosclerosis likewise can be brough about by the deposition of fat underneath the endometrium, diminishing the versatility of arteries. This arterial damage is brought about by an array of critical hazard factors, for example hypertension [11].

Signs and Symptoms

- chest pain or angina
- pain in your leg, arm, and anywhere else that has a blocked artery
- shortness of breath
- fatigue
- confusion, which occurs if the blockage affects circulation to your brain
- muscle weakness in your legs from lack of circulation [12].
- Fainting

Ischemia

Ischemia is defined as the inadequate supply of blood to a local area because of the blocakgae if blood vessels supplying the area. At the point when blood stream to the heart muscle is totally hindered, the heart muscle cells die, which is termed as a heart attack or myocardial infarction. It is the main cause of death in both men and women. Ischemia for the most part occurs in patients with coronary heart disease, yet additionally can happen in individual with vascular disease, hypertrophic cardiomyopathy and uncontrolled hypertension. Rarely patients with typical coronary supply routes may encounter angina identified with coronary spasm or endothelial dysfunction [13].

Signs and Symptoms

- Chest pain and pressure
- Cough and congestion
- Dizziness or lightheadedness
- Fainting
- Shortness of breath
- Tiredness
- Weight gain [14]

Hypertrophy

Ventricular hypertrophy is an inauspicious escalation of hemodynamically upsetting conditions, for example, hypertension and valve disease. The pathophysiology of hypertrophy is unpredictable and multifactorial, as it addrsses a few cellular and molecular systems. In presence of severe stressful conditions such as hypertension and valvular disease, a form of pathological hypertrophy develops, which is characterized by excessive increase in ventricular dimensions, accompanied by myocardial dysfunction and fibrosis. These are forboding indications of the development of heart failure and neurotic rebuilding. Ventricular hypertrophy is subsequently considered as an indicator of cardiovascular grimness and mortility [15].

Signs and Symptoms

- Shortness of breath, especially during exercise
- Chest pain, especially during exercise
- Fainting, especially during or just after exercise or exertion
- Sensation of rapid, fluttering or pounding heartbeats (palpitations)
- Heart murmur, which a doctor might detect while listening to your heart [16]

Oxidative Stress

A conspicuous marker of coronary illness is the nearness of oxidative pressure when there is abundance creation of ROS relative cancer prevention agents. Significant parts are ROS, temperamental atoms that harbor unpaired electrons that respond without any problem. This assumes a significant job in the pathophysiology of cardiovascular disease, including post myocardial ischemia and cardiovascular breakdown. Oxidative pressure is instrumental in cultivaring change in redox flagging, intracellular pathway and cell brokenness. This obsessive changes finish in cardiovascular diseases.

ROS are created in the mitochondria, xanthine oxidase, and NADPH (nicotinamide adenine dinucleotide phosphate) oxidase, as well as in nitric oxide synthase NOS. The harm caused by ROS is significant in the mitochondria. Proteins of the excitation— contraction coupling are seriously influenced, and that damage is significant. KOS are also involved in endothelial dysfunction, LDL oxidation, and inflammation [17].

Signs and Symptoms: • Fatigue

- Memory loss and/or brain fog
- Muscle and/or joint pain
- Wrinkles and grey hair
- Decreased eye sight
- Headaches and sensitivity to noise
- Susceptibility to infections [18]

Vascular Injury

The vasculature is a significant well spring of ROS. The inward mitochondrial layer transport electrons from the co-enzyme NADH to an electron acceptor, eventually yielding adenosine triphosphate (ATP). The ROS age adds to hypertension and injury brough about by ischemia reperfusion in herat failure, xanthine oxidass decrease has a significant job in endothelial dysfunction. Cell guard instruments, including super oxide dismmutase (Turf), glutathione reductase (GSR), and catalse feline, keep KOS creation in balance, ROS age due to unoupling of nitric oxide (NO) age from amino acids additionally adds to vascular injury and irritation. The communication of NO and ROS causes oxidative/ nitrosative pressure. Ca+2 over burden is a an auxiliary impact and myocardial ischemia reperfusion is a piece of these falling occasions [19].

Signs and Symptoms

- Observed pulsatile bleeding.
- Arterial thrill (ie, vibration) by manual palpation.
- Bruit over or near the artery by auscultation.
- Signs of distal ischemia.
- Visible expanding hematoma [20].

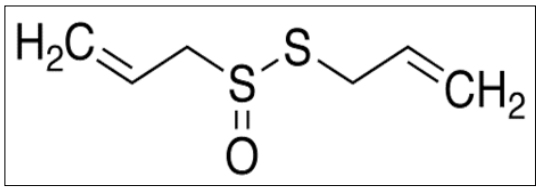
Herbal Drugs Used in Cardiovascular Diseases

1. **Garlic**

Synonyms: Garlic, Allium [21]
Biological Source: This consists of bulbs of the plant known as Allium sativum Linn.
Family Liliaceae. It contains not less than 0.2 % of alliin on dried b specific asis [21].

Chemical Constituents

- Garlic bulbs contain 29 per cent of carbohydrates, about 56 per cent of proteins (albumin), percent of fat, mucilage, and 0.06 – 0.1 % of volatile oil.
- It also contains phosphorous, iron and copper.
- Volatile oil of the drug is the chief active constituent, and contains allyl propyl disulphide, diallyl disulphide, alliin and Allicin. Alliin by action of enzyme allinylase is converted into allicin. Garlic oil is yellow in colour and has gravity of 1.046. It is optically inactive.(21)



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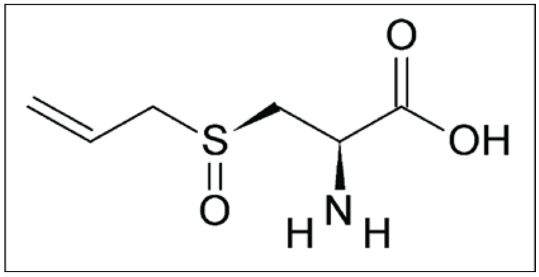


ALLIN

Uses
Cardiovascular: Garlic as a source of flavonoids, lowers the risk of hypertension and ischemic heart disease. Additionally it reduces plaque formation. Garlic extracts also exhibit antihypertensive and antiapoptotic properties. Garlic oil is useful in treating high blood pressure and atherosclerosis. Platelet aggregation and subsequent thrombus formation are significantly reduced by garlic and its constituents. Fibrinolysis is also enhanced by garlic, resulting in dissolution of clots and thrombi. Common preparations that have been investigated are raw garlic, garlic powder, tablets, oil of steam – distilled garlic, oil of oil- macerated garlic and aged garlic extract (AGE) [22, 23].
Mechanism: Garlic has been shown to inhibit enzymes involved in lipid synthesis, decrease platelet aggregation, prevent lipid peroxidation of oxidized erythrocytes and LDL, increase antioxidant status [23].

Other Uses

- Garlic is used universally as a flavoring agent, traditional medicine and as functional food to enhance physical and mental health.
- It is used as carminative, aphrodisiac, expectorant stimulant and disinfectant. It is largely used as a condiment.
- Oil of garlic is used as antihelmintic and rubefacient.
- Allicin and other sulphur compounds are said to be the major compounds responsible for antimicrobial effect.
- Fresh garlic is prophylactic against amoebic dysentry.
- Garlic is also used in the treatment of tumors, Worms, bites, and other ailments.
- It is also used to prevent cancer and other chronic diseases associated with ageing.
- Garlic alters the blood sugar level, hence used under supervision on patients with antidiabetics.
- Allicin produced by the garlic enzyme allinase from the alliin has been shown to have wide range of antifungal specificity.
- Garlic extracts have been shown to exert anti. Inflammatory effects.
- Aged garlic extract has been shown to have superior immunomodulatory properties.(21,23)

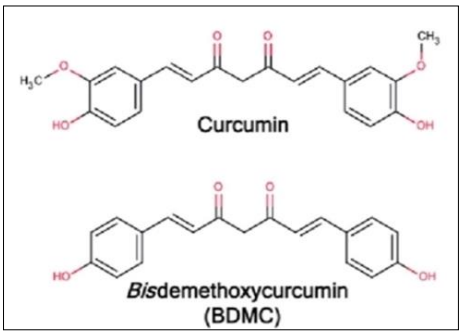
2. Turmeric

Synonyms: Indian saffron, Curcuma, Turmeric, Haldi [24].
Biological Source: Turmeric consists of dried as well as, fresh rhizomes of the plant known as Curcuma longa Linn. (C. domestica), belonging to family Zingiberaceae. It contains not less than 1.5% of curcumin [24].

Chemical Constituents

- Turmeric contains about 5% of volatile oil, resin, abundant zingiberaceous starch grains and yellow colouring substances known as curcuminoids.
- The chief component of curcuminoids is known as Curcumin (50-60%).
- Chemical curcuma species contain volatile oil, starch and curcumin.
- Curcumin and other related curcuminoids such as demethoxy curcumin and bisdemethoxycurcumin are reported to be responsible for the yellow colour in some species.
- Volatile oil content ranges from 1-6.5 % and is composed of mono and sesquiterpene such as alpha phellandrene, camphor, camphene, DL-ar-termeronezingiberacea and alpha, beta curcumenes,

species like c.angustifolia and C.caulina have high starch content and are used as a substitute [24].



Uses

Cardiovascular: Curcumin, an active component of turmeric is a powerful antioxidant. It also reduces LDL, triglycerides and lipid peroxides.it prevents hypertrophy in cardiomyocytes and alters gene expression. It blocks the onset of HF in hypertensive heart disease and inhibits nuclear acetylation. It also has anti-thrombotic properties. The antioxidant effects of curcumin have been shown to alternate adriamycin-induced cardiotoxicity and may prevent diabetic cardiovascular complication. The anti-thrombic, anti-proliferative and anti-inflammatory effects of curcumin and the effect of curcumin in decreasing the serum cholestrol level may protect against the pathological changes occuring with atherosclerosis. The inflammatory effects of curcumin may have the possibility of preventing atrial arrhythmias and the possible effect of curcumin for correcting the calcium homeostasis may play a role in the prevention of some ventricular arrhythmias [25, 26].

Other uses

- Turmeric is used as a condiment or a spice, and coloring agent, especially for ointment and creams.
- Chemically, it is used for the detection of boric acid.
- It has antiseptic and anti-inflammatory properties too.
- Turmeric are official in various Pharmacopoeias. Apart from traditional uses curcumin has been proved as an anti-inflammatory drug.
- Antiarthritic agent has been isolated from C.aromatica
- In china C.wenyjuin (C.aromatica) has been used in cervical cancer.
- Curcuminoids isolated from ethylacetate extract of turmeric have shown modest HIV-1 and HIV-2 protease inhibitory activity [24, 26].

3. Capsicum

Synonyms: Chillies, Cayenne pepper [28].

Biological Source: Capsicum consists of dried ripe fruits of Capsicum annum Linn. Var: minimum, belonging to family Solanaceae. It contains not less than 0.25 % of capsaicin on dried basis [28].

Chemical Constituents

Capsicum contains about 0.5 – 0.9 per cent colourless, crystalline, and pungent principle, known as capsaicin which is volatile above 65°C.

- Capsicum also contains fixed oil (4 – 16%) proteins and pigments, viz. Capsanthin and carotene. Pigments are responsible for the red colour. Thiamine and ascorbic acid are the other contents of drug [28].

Uses

Cardiovascular: Capsicum is used for conditions of the heart and blood vessels including poor circulation, excessive blood clotting, high cholesterol, and to treat heart diseases, stroke, and muscle tension. It is also used to prevent atherosclerosis [29].

Mechanism: Capsicum and its constituent, capsacin, exerted their antihypertensive effect by several mechanisms, including releasing vasodilator neuropeptides through TRPVI activation, stimulating of natriuresis and diuresis, an angiotensin converting enzyme (ACE inhibitory activity and L-type calcium channel inhibition in smooth muscle cells).
It exerts anti-hyperlipidemic effect mostly by reduction of cholesterol intestinal absorption and evaluation of cholesterol and its excretion in feces [30].

Other Uses

- Capsicum fruits are applied topically in pain disorders, neuropathy, cluster headache, migraine, psoriasis, trigeminal neuralgia, and heroes zoster.
- Also it has been used to treat dyspepsia, loss of appetite and flatulance.
- It also used for the treatment of postmastectomy syndrome, rhumetoid arthritis, reflex sympathetic dystrophy, dermatitis or eczema, itching, postoperative nausea and vomitting, bladder hyperactivity, gall stone, anorexia, haemorrhoids, liver congestion, tonsillitis and rhinitis, and fibromyalgia.
- It is also used as pesticides, analgesic, antiobesity, antihypertensive, antiarrhythmic, antiischemic and gastroprotective agent [29, 30].

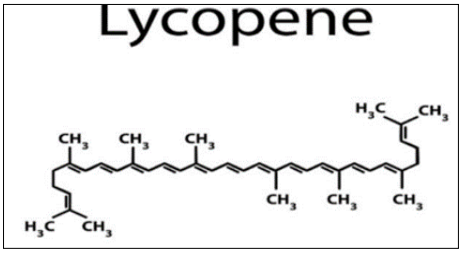
4. Tomato

Synonym: Lycopersicon, lycopersicum, Lycopersicon esculentum [32]

Biological Source: Lycopersiconesculentum Mill. The tomato is the edible, often red, berry of the plant solanumlycopersicum, commonly known as a tomato plant belonging to the family Solanaceae [32].

Chemical Constituents:

- Lycopersicon esculentum contains carbohydrates, fats, protein, vitamins such as thiamine, niacin, vitamin B6, Vitamin C E and K.
- Minerals such as magnesium, manganese, phosphorus, potassium.
- The main chemical constituent of lycopersiconesculentum is lycopene [32].



Uses

Cardiovascular: Lycopene present in tomato juice is closely related to betacarotene and reduces the risk of CHD. Its antioxidant property contributes to the reduction of blood pressure. Blood pressure reduction was attriributed to tomato extract's help in hypertension. Vascular function improvement in CVD with dietary lycopene supplementation was noted. It also reduces blood pressure in patients with untreated prehypertension and reduced systemic inflammation in patients with type 2 diabetics [33].

Mechanism: Macrophages inside the arterial wall use the oxidized LDL to initiate plaque formation that is prevented by dietary antioxidants, which significantly lowers the level of LDL. Lycopene inhibits the activity of an enzyme in cholesterol synthesis and aids in the prevention of CHD [34].

Other Uses

- Tomatoes contain a high level of lycopene, which is a substance that is used in some of the most pricy facial cleansers.
- High levels of lycopene in tomatoes works to reduce chances of developing prostate, colorectal and stomach cancer.
- Tomatoes help maintain strong bones.
- They also help repair damage caused by smoking.
- Tomatoes contain a great deal of vitamin A and C. This is primarily because these vitamins and beta-carotene work as antioxidants to neutralize harmful free radicals in the blood.
- Tomatoes are good for hair, kidney, eyes etc
- It is effective in diabetics to keep their blood sugar levels under better control. For instance, dietary capsaicin effectively lowered plasma cholesterol and inhibits the formation of atherosclerotic plaque.
- Capsaicin may have an ameliorting effect on fasting serum HDL-C [33].

Discussion

- **Garlic:** The studies point to the fact that garlic reduces cholesterol, inhibits platelet aggregation, reduces blood pressure and increase antioxidant status. Since 1993, 44% of clinical trials have indicated a reduction in total cholesterol, and the most profound effect has been observed in garlic's ability to reduce the ability of platelets to aggregate. Mixed results have been obtained in the area of blood pressure and oxidative stress reduction. Invitro studies have demonstrated that aged garlic extract improves circulation and blood properties by preventing lipid peroxidation and hemolysis in oxidizes erythrocytes [23].
- **Turmeric:** Curcumin, a yellow pigment in the spice turmeric, has been used for centuries as a treatment for inflammatory diseases. Extensive research from the past two decades has shown that Curcumin mediates it's antiinflammatory effects through the down regulation of inflammatory transcription factors (such as nuclear factor kappa beta), enzymes (such as cyclooxygenase 2 and 5 lipoxygenase) and cytokines (such as interleukin 6). Because of the crucial role of inflammation in most chronic diseases, the potential of Curcumin has been examined in neoplastic, neurological, cardiovascular, pulmonary and metabolic diseases [27].
- **Capsicum:** Capsicum is rich in capsaicin. Many cellular experiments found that capsaicin performed some health benefits including having anti-inflammatory effects, decreasing plasma cholesterol levels and promoting metabolic health. Fir instance, dietary capsaicin effectively lowered plasma cholesterol and inhibited the formation of atherosclerotic plaque [31].
- **Tomato:** Lycopene, a carotenoid without provitamin A activity found in high concentrations in small set of plant foods, has significant antioxidant potential invitro and may play a role in preventing prostate cancer and CVD in humans. Lycopene may have a cholesterol synthesis- inhibiting effect and may enhance LDL drug relation. Available evidence suggests that intimal wall thickness and risk of myocardial infarction are reduced in persons with higher adipose tissue concentrations of lycopene [34].

Conclusion

Nutraceutical is a blend of 'nutrition' and 'pharmaceutical'. Nutraceuticals are a part of food which play a significant role in modifying and maintaining normal physiological function of body that maintains good health of human beings. The main reason for the growth of nutraceutical market comprehensively are the current population and the health trends. The food products used as nutraceuticals can be categorised as dietary fibre, prebiotics, polyunsaturated fatty acids, antioxidants and other different types of hervak/natural foods. Epidemiological and clinical studies indicate that the risk of CVD is reduced by a diet rich in fruits, vegetables, unrefined grains, fish, low-fat dairy products, and low unsaturated fats and sodium.

Risk factors such as unbalanced diet, no exercise, overweight, smoking drinking etc should be avoided and should be replaced with better alternatives such that they can be influenced positively to minimise cardiovascular diseases.

As seen above some of the nutraceuticals such as garlic, turmeric, capsicum and lycopene have been effective in reducing the risk of cardiovascular diseases, we can say that advances in the knowledge of both disease process and

dietary components have provided new avenues to develop dietary strategies to prevent and treat cardiovascular diseases.

Although the ingredients of Nutraceuticals that are beneficial for combating CVD and many heart conditions have been identified, considerable work needs to done to elucidate the actual mechanism oh how these ingredients act. This would also enable the production of synthetic products that could be added to the diet as supplements ensuring the better cardiac health.

Nutraceuticals should be included into a healthy diet as the physiological effects produced by them are as powerful as pharmaceutical intercedings, yet much safer.

More and more efforts should be put to increasing the consumption of vitamin-rich fruits and vegetables.

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References

1. Ramesh C Gupta. "Nutraceuticals (Efficacy, Safety and Toxicity)", Introduction Pg no. XV
2. "Wilfried Andlauer, Peter Furst", "Nutraceuticals: A piece of history, present status and outlook", Article in Food Research International, December, 2002. DOI: 10.1016/S0963-9969(01)00179-X.
3. "Bozena Sosnowska, Peter Peerson, Maciej Banach", "The role of Neutraceuticals in the prevention of cardiovascular diseases", 'Cardiovascular Diagnosis and Therapy'. 2017; 7(Suppl):S21-S31, DOI: 10.21037/CDT.2017.03.20, PMCID: PMC5418215, PMID: 28529919.
4. Ramesh C Gupta. "Neutraceuticals (Efficacy, Safety and Toxicity)", Pg no. 49
5. "Eman M Alissa, Gordon A Ferns. Review article – Functional foods and Nutraceuticals in the primary prevention of cardiovascular diseases, Journal of Nutrition and Metabolism, 2012. Article ID 569486, DOI: 10.1155/2012/569486.
6. https://books.google.co.in/books?I'd=ziSQDwAAQBAJ&pH=PA9&dq=chest+pain+is+the+central+symptom+of+angina+and+heart+attack+.+frequently&hl=en&sa=X&ved=0ahUKEwiz3jb2xd7pAhV0zzgGHbyNCfAQ6AEIJjAA#v=onepage&q=chest%20pain%20is%20the%20central%20symptom%20of%20abgina%20and%20heart%20attack%20.%fr equently&f=false
7. Ramesh C Gupta. "Nutraceuticals (Efficacy, Safety and Toxicity)", pg no.49
8. https://www.mayoclinic.org/diseases-conditions/heart-failure/symptoms-causes/syc20373142
9. "Zanchetti Alberto Injita, Toshiro, Mancia, Ginseppe", "Journal of Hypertension", 2005, 23, Issue pS1, doi: 10.1097/01.hjh.0000165621.34192.26
10. https://www.webmd.con/hypertension-high-blood-pressure/guide/hypertensionsymptoms-high-blood-pressure
11. "Jennifer Gander, Xuemisui, Steven N. Blair", Factors related to Coronary heart disease risk among men: validation of Fremingham risk score, preventing chronic disease, "Public Health Research, Practice and Policy", 2014, 11:E140, Published online 2014 August 14; doi: 10.5888/pcd 11.140045; PMCID: PMC4133511, PMID: 25121352 https://www.healthline.com/health/atherosclerosis#prevention
12. David C Gaze. "Introduction to Ischemic Heart Disease", July 2nd 2012, Review: November 26th 2012, published: February 15th, 2013
13. https://www.healthline.com/health/ischemic-cardiomyopathy#symptoms
14. "Mostafa Samak, Javid Fatullayer, Alexander Werfmann. Cardiac Hypertrophy: An Introduction to Molecular and Cellular Basis, " Medical Science Monitor Basic Research", 2016; 22:75-79, published online 2016 July 23, doi: 10.12659/MSMBR.900437, PMCID: PMC49767558, PMID: 37450399
15. https://www.mayoclinic.org/diseases-conditions/hypertrophic-cardiomyopathy(symptoms-causes)syc-20350198
16. Ramesh C Gupta. " Neutraceuticals, (Efficacy, Safety and Toxicity), Pg no. 50
17. https://www.linkedin.com/pulse/5-signs-oxidative-stress-7-ways-you-can-stop-wilson-hd-cpm-cns/
18. Ramesh C. Gupta, " Neutraceuticals, (Efficacy, Safety and Toxicity), Pg no. 50
19. https://wikem.org/wiki/vascularinjury
20. "CK Kokate, A.P.Purohit, S.B. Gokhale", "Textbook of Pharmacognosy", vol-II, 45th edition, June, Nirali Prakashan Publication, Pg no: 1.51-1.52, 2010.
21. Ramesh C Gupta. "Neutraceuticals, (Efficacy, Safety and Toxicity), Pg no. 52-53
22. "Khalid Rahman, Gordon M. Loire", "Garlic and Cardiovascular Disease: A Critical Review." The Journal of Nutrition. 2006; 136(3):736S-740S, https://doi.org/6.1093/Jh/13.6.3.736S (Published on 01 March 2006)
23. "CK Kokate, Purohit AP, Gokhale SB. "Textbook of Pharmacognosy", Vol-II, 45th edition, June, Nirali Prakashan Publication, Pg no. 1,109-1,110, 2010
24. Ramesh C Gupta. "Neutraceuticals, (Efficacy, Safety and Toxicity), Pg no. 55
25. Wanwaraug Wongcharoen, *et al*. Int J cardiol, The Protective Role of Curcumin in Cardiovascular Diseases, 2009.
26. Bharat B Aggarwal, *et al*. Trends pharmacol Sci. Feb – "Pharmacological Role of Curcumin in Chronic Diseases: An age-old spice with modern targets)", PMID: 19110321 Review, 2009.
27. "CK Kokate, Purohit AP, Gokhale SB. "Textbook of Pharmacognosy", Vol-II, 45th edition, June, Nirali Prakashan Publication, Pg no. 1,107-1,108, 2010.
28. https://www.rxlist.com>supplements
29. "Setareh Sanati, Bibi Marjan Razavi, Hossein Hosseinzadeh", " A review of the effects of Capsicum annum L. and its constituent, capsaicin, in metabolic syndrome – Iranian Journal of Basic Medical Sciences

–May. 2018; 21(5):439-448. doi: 10.22038/IJBMS. 2018.25200.6283, PMCID: PMC6000222, PMID: 29922422
30. "Yu Qin, Li Ran, Jun Dong Zhu. "Capsaicin supplementation improved risk factors of Coronary Heart Disease in individuals with low LDL-C levels", Article – Nutrients, 2017, (9):1037, Published Online: 20 September 2017, doi: 10.3390/mo.9091037, PMCID: PMC5622794, PMID: 28930174
31. https://en.m.wikipedia.org/wiki/tomato
32. Ramesh C Gupta. "Neutraceuticals, (Efficacy, Safety and Toxicity), Pg no. 56
33. "Lenore Arab, Susan Steck", "Role of Lycopene in the prevention of Cardiovascular Diseases", The American Journal of Clinical Nutrition. 2000; 71(6):1619S-1695S. https:// doi.org/10.1093/ajcn/71.6.1691S.
34. "Arati A Inamdar, Ajinkya A Inamdar. Heart failure: Diagnosis, Management and Utilisation, "Journal of Clinical Medicine". 2016; 5(7):63. Published online 2016 June 29, doi: 10.3390/jcm 5070062, PMCID: PMC4961993, PMID: 27367736.