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WAGING GREEN WAR AGAINST CARDIOVASCULAR AILMENTS

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ABSTRACT
Cardiovascular ailments rank first in the morbidity and mortality worldwide. It includes a variety of diseases such as hypertension, hyperlipidemia, antherosclerosis, thromboembolism, coronary heart disease, heart failure, etc. With the caveat that the most consistent recommendations from a public health perspective involve multiple changes in diet and exercise, medicinal plants are also a viable option for the treatment and prevention of this killer disease. In traditional botanical knowledge, herbal medicines are used for the treatment of cardiovascular disorders. Recent research findings have shown that not only the extent of cultivation and production of medicinal plants have been reduced, but also the consumption has increased. It is not surprising that a great deal of research is now focused on identifying new therapeutic alternatives to prevent and treat this disease. This review examines herbal medicines that affect the cardiovascular system both in terms of efficacy and safety as gleaned from the scientific literature that is available. These herbs are categorized under the primary diseases they treat. However, most herbal medicines have multiple cardiovascular effects that frequently overlap. In the last three decades, a lot of concerted efforts have been channeled into researching the local plants with atherosclerotic and antihypertensive therapeutic values. However, ayurvedic knowledge needs to be coupled with modern medicine and more scientific research needs to be done to verify the effectiveness, and elucidate the safety profile of such herbal remedies.

KEYWORDS: Cardiovascular disorders, atherosclerotic, antihypertensive, hyperlipidemia, herbal.

INTRODUCTION
Studies show that cardiovascular diseases are currently the leading cause of death in industrialized countries. In the year 1999 about 960,000 Americans died of cardiovascular Disease (CVDs). So CVD accounted for about 40.1% of all deaths in U.S.A.[1] In India, in the past 5 decades, rates of CVD among urban populations have risen from 4% to 11%. World Health organization (W.H.O.) gave a report in 2009 that globally cardiovascular diseases are the number 1 cause of death and is projected to remain so (Fig-1). In 2012, an estimated 17.5 million people died from CVDs, representing 31% of all global deaths. CVDs can be prevented by an intervention on behavioral risk factors: tobacco use, unhealthy diet and obesity, physical inactivity and harmful use of alcohol. Diabetes mellitus and hypertension are increasing, being major public health problems.[2,3] Cardiovascular diseases include a broad range of diseases, including cerebrovascular disease, peripheral arterial disease, rheumatic heart disease, congenital heart disease, hypertension, hyperlipidemia, thromboembolism, coronary heart disease, heart failure, etc.[4] Hypertension is the most common disorder and is known as a risk factor for the diagnosis of myocardial infarction, stroke, peripheral vascular disease, and a major factor in the development of cardiovascular disease and mortality.[5] Great deal of research is now focused on new alternative therapeutic methods to treat the disease. Medicinal plants can be a viable option to treat heart ailments. The dietary factors are important to protect coronary heart disease, such as antioxidants (minerals: selenium and zinc; compounds: flavonoids), that are presents on fruit and vegetables.[6]

Antherosclerosis
Is the medical term for hardening or thickening of the artery wall. It is a situation characterized by the narrowing of the arterial wall with large number of smooth muscle cells and deposits of cholesterol and other substances in the portion of the vessel wall closest to the lumen. The mechanism that initiates this thickening is not clear, but it is known that cigarette smoking, high plasma cholesterol concentration, hypertension, diabetes and several other processes increase the incidence and severity of the antherosclerotic process. In a very destructive and painless process the symptoms of antherosclerosis affects the cardiovascular system in general. This is usually progressive after leading ultimately to complete occlusion.[7] (Fig-2)

Coronary artery spasm
It is a condition in which the smooth muscle of a coronary artery undergoes a sudden contraction, resulting in vasoconstriction. Although the causes of coronary artery spasm are not well known, smoking, stress and alcoholism are said to be triggering agents. (Fig-3)

Hypertension
It is high blood pressure, which occurs when the pressure in the arteries is consistently higher than normal, indicating that the heart is working harder to pump blood through the circulatory system. High blood pressure may not produce symptoms until a major organ is damaged. People suffering persistently high blood pressure are at a risk of a heart attack or stroke and even kidney failure. Hypertension causes a variety of problems. It develops an adaptive increase in muscle mass. Its pressure also enhances the development of arteriosclerosis and heart attacks. The severe strain imposed on the cerebral arteries that supply the brain causes its weakening ultimately leading to rupture and causing brain haemorrhage. The Kidney are another prime target of hypertension, it causes narrowing of the human of the arterials of kidney. To combat this, kidney secretes renin which further raises the blood pressure and aggravates the problems.[8]

Peripheral Arterial Disease (PAD)
Peripheral arterial disease (PAD) is a form of antherosclerosis involving the arteries in the arms, legs, neck, kidneys and lower abdomen. This can cause pain and difficulty in walking. (Fig-4)

Heart Attack
It occurs when the blood flow to part of the heart is blocked, usually by a blood clot or a piece of dislodged plaque. If the blood flow to the heart is either blocked or significantly reduced for more than a few minutes, the part of heart muscle begins to die. (Fig-5).

Heart Failure
Heart failure occurs when the heart fails to pump blood efficiently, robbing the body of the necessary blood or oxygen. Common symptoms of heart failure include 'oedema' and 'pulmonary congestion'. Odema is swelling in the feet, ankles or legs and pulmonary congestion is fluid build- up in the lungs. (Fig-6).

India accounted for 17% of all CVD deaths in the world. CVDs in India alone accounted for around 2.4 million deaths, in contrast to nearly 3.2 million deaths in all the industrialized countries together.[9] Asian Indians are at highest risk of heart disease in the world. As lifestyle changes in India, heart disease is hitting epidemic proportions.[10] While there are literally hundreds of plants used around the globe used traditionally for the treatment of heart ailments, very few of these plants have been thoroughly scientifically investigated. However, some medicinal plants have sufficient pre-clinical and more clinical data, indicating that these botanical dietary supplements and their constituents have a possible use in strategies to reduce the prevalence and mortality of cardiovascular disease either in the general population or subsets of individuals at high risk. The usage of natural herbs increased because of beneficial effects of herbs and easier return to nature in comparison to chemical drugs. In some countries, 80% of the drugs supplied to the pharmaceutical market have natural origin, so that now 90% of people in these countries use herbal medicines. Recent research findings have shown that not only the extent of cultivation and production of medicinal plants have not been reduced, but also day-to-day production and consumption have increased.[11] The secondary metabolites of plants like phenols, flavonoids,alkaloids, terpenes amines are potent active compounds that has potential in preventing this disease and associated harmful complications, especially through reducing cholesterol, preventing increase in free radicals, and ultimately decreasing vascular plaque and vascular resistance. They, alone or in combination with hypocholesterolemic drugs, can therefore be useful for patients with hyperlipidemia and its complications. In the light of the growing prevalence of cardiovascular diseases and reduction in age at development of these diseases, it is necessary to find the drugs and medicinal plants that are routinely used in diet, are capable of controlling and preventing the development of atherosclerotic plaques, and can decrease risk factors for cardiovascular diseases. Antihypertensives are a class of drugs that are used to treat hypertension (high blood pressure). Antihypertensive therapy seeks to prevent the complications of high blood pressure, such as stroke and myocardial infarction. The reduction of the blood pressure by 5 mmHg can decrease the risk of stroke by 34%, of ischaemic heart disease by 21%, and reduce the likelihood of dementia, heart failure, and mortality from cardiovascular disease.[12] Attempts by the low-income group, particularly the rural dwellers in the developing countries, to control cardiac ailments and its attendant complications in the face of the scarce socioeconomic resources, have led more people opting for herbal remedy. This review provides an introduction of the naturally occurring medicinal plants that have so far been scientifically studied and reported to have antihypertensive or atherosclerotic effects.

Herbs having Potential role in Cardiovascular Ailments
Allium sativum (Family: Amaryllidaceae; Common name: Garlic). Garlic has long been used for a variety of cardiovascular conditions, especially hyperlipidemia. It has also been reported to have hypotensive action. It is thought to increase nitric oxide production, resulting in smooth muscle relaxation and vasodilatation. One of the primary active compounds that gives garlic its characteristic odor and many of its healing benefits is called allicin. Meta-analysis of randomly chosen literary data has demonstrated that garlic is related to decrease of BP in patients with increased systolic pressure, but not in patients without increased systolic pressure.[13] Garlic

preparations have been found to be superior to placebo in reducing BP in individuals with hypertension. The study points to the beneficial cardioprotective action of garlic.[14]

Annona muricata (Family: Annonaceae; Common name: Prickly Custard apple). *A. muricata* is a species known mostly for its edible fruits. The leaf extract of the plant has been reported to lower an elevated BP by decreasing the peripheral vascular resistance.[15]

Apium graveolens (Family: Apiaceae; Common name: Celery). The juice is used orally with equal amounts of honey to control B.P. The difference of BP in human beings before and after treatment has been found to be significant ($P<0.05$), indicating that seeds of *A. graveolens* can be used as a safe and effective treatment of high BP. Fresh celery juice can be mixed with vinegar to relieve dizziness and headache and shoulder pain associated with hypertension.[16]

Avena sativa (Family: Poaceae; Common names: Dietary Fiber, Green Oat). A diet containing soluble fiber-rich whole oats can significantly reduce the need for antihypertensive medication and improve BP control. Considering the lipid and glucose improvements as well, increased consumption of whole oats may significantly reduce cardiovascular disease risk.[17] The addition of oat cereals to the normal diet of patients with hypertension has been found to significantly reduce both systolic and diastolic BP. Soluble fiber-rich whole oats may be an effective dietary therapy in the prevention of cardiac disorder.[18]

Boerhaavia diffusa (Family: Nyctaginaceae, Common name- punarnava). The root of this plant has shown great therapeutic uses especially in relation to heart problems. It is a great antistress agent and the alkaloid fraction of the root has evidenced a dramatic effect in reducing elevated levels of cortisol under stressful conditions. It lowers blood pressure.[19] It cleanses blood, as cardiotonic it tones, balances, strengthens the heart. *Boerhaavia* extract has significant antioxidant activity. It is a Cardiac depressant.[20]

Camellia sinensis (Family: Theaceae; Common name: Tea). There are many potential health benefits from drinking tea. There is lots of interest among researchers on the effect of tea on cardiovascular disease. Research on tea and hypertension is contradictory. Population research links consumption of green tea (unfermented) (*Camellia sinensis*) and oolong tea (partially fermented) (*Camellia sinensis*) with a decreased risk of developing B.P.[21]

Carum copticum (Family: Umbelliferae; Common name: Ajwain). The crude extract of *C. copticum* (1-30 mg/kg) produces a fall in BP and heart rate (HR) of anesthetized normotensive (NMT) rats. Hypotension produced is very brief and returns to normal within a minute. At the low dose (up to 1 mg/kg), the crude extract produces negligible change in the HR. However, bradycardia has been reported at the higher doses (10-30 mg/kg).[22]

Cassia occidentalis (Family: Caesalpiniaceae; Common name: Coffee weed). It is a small tree growing 5 to 8 m in height. The leaf of this plant is used in local folk medicine as an antihypertensive agent. *In vitro*studies of the leaf extract have shown a relaxant effect on the aortic rings. The studies revealed that cassia extract may be relaxing smooth muscle and reducing BP by inhibiting Ca^{2+} influx through receptor-operated channel and voltage-sensitive channel, showing its nonselectivity on these Ca^{2+} channels.[23]

Coleus forskohlii **(**Family: Lamiaceae; Common name: Karpurvali). The pharmacological properties of coleonol, a diterpene, isolated from *C. forskohlii*, have been investigated. Its predominant effect has been to lower the BP of anesthetized cat and rat as well as of the spontaneously hypertensive rat due to relaxation of the vascular smooth muscle. In small doses, it has a positive inotropic effect on isolated rabbit heart as well as on cat heart *in vivo*. Coleonol also exhibits nonspecific spasmolytic activity on smooth muscle of the gastrointestinal tract in various species, but not on bronchial musculature of guinea pig. Large doses of coleonol have a depressant action on the central nervous system.[24]

Commelina virginica (Family: Commelinaceae; Common name: Virginia dayflower). It is a perennial herbaceous plant in the dayflower family. Whole plant extract has been reported to decrease the tension of phenylephrine-stimulated isolated guinea pig aorta rings by 15 to 35%.[25]

Crataegus pinnatifida (Family: Rosaceae; Common name: Chinese Hawthorn). It has been used in China as a decoction for treatment of cardiac disorder for thousands of years. Pharmacological and clinical trials have shown that it lowers BP. The two main substances that contribute to hawthorn's beneficial effects on heart are flavonoids and oligomeric procyanidins, which are potent antioxidant agents. Crataegin, coumarin, phenylethylamine and triterpenoids metabolites of this species has demonstrated anability in preventing strokes and reducing the risk of heart attack by lowering BP, increasing circulation, and inhibiting both the formation of plaque on arterial walls and formation of blood clots in the brain, heart, and arteries.[26] In experiments with anesthetized rabbits, intravenous administration of the extract preparation lowered the BP for up to 3 hours.[27]

Cuscuta reflexa (Family: Cuscutaceae; Common name: Giant dodder). Crude extract of *C. reflexa* has been reported to cause a decrease in systolic and diastolic BP as well as HR in anesthetized rats. The antihypertensive activity and bradycardia produced were found to be

dose-dependent, but the decrease in HR was observed at slightly higher doses. Pretreatment with atropine (1 mg/kg) did not abolish the cardiovascular responses to *C. reflexa*.[28]

Daucus carota **(**Family: Umbelliferae; Common name: Carrot). It has been used in traditional medicine to treat HTN. Activity-directed fractionation of aerial parts of *D. carota* resulted in the isolation of two coumarin glycosides coded as DC-2 and DC-3. Intravenous administration of these compounds caused a dose-dependent (1–10 mg/kg) fall in arterial BP in NMT anesthetized rats. In the *in vitro* studies, both compounds caused a dose-dependent (10–200 µg/ml) inhibitory effect on spontaneously beating guinea pig atria as well as on the K^+-induced contractions of rabbit aorta at similar concentrations.[29]

Desmodium styracifolium **(**Family: Leguminosae; Common name: Osbeck). Preparations from the dry leaves and stem of the plant injected intravenously into anesthetized dogs increased coronary circulation, lowered arterial BP, slowed HR, and decreased the oxygen consumption of the heart.[30]

Emblica officinalis (Family: Euphorbiaceae, Common name: Amla). It provides a broad-based approach in preventing cardiovascular damage through its powerful cholesterol regulating and multifaceted anti-oxidant properties. *Emblica* has the ability to lower cholesterol and actually reduces plaque in clogged arteries caused by high cholesterol levels in some animal studies. Amla is a potent scavenger of free radicals.[31] The use of amla as an antioxidant has been examined by many scientists It is also useful as a blood purifier.[32]

Lavandula stoechas (Family: Lamiaceae; Common name: French Lavender). Crude extract of *L. stoechas*has been reported to produce a fall in BP and HR in anesthetized NMT rats. Pretreatment of atropine abolished the cardiovascular responses, suggesting that the antihypertensive and bradycardia effects of the crude extract may be mediated through mechanism(s) similar to that of acetylcholine.[33]

Linum usitatissimum (Family: Linaceae; Common name: Linseed, Flaxseed). Linseed and its oil are rich in α-linolenic acid, an essential fatty acid that appears to be beneficial for the heart diseases, inflammatory bowel disease, arthritis, and other health problems. α-linolenic acid belongs to a group of substances called omega-3 fatty acids. Several studies suggest that diets rich in omega-3 fatty acids lower BP significantly in people with HTN. Flaxseed may protect against atherosclerotic cardiovascular disease through a number of mechanisms, including reducing serum cholesterol, platelet aggregation, and inflammatory markers; improving glucose tolerance; and acting as an antioxidant. Daily consumption of 15 to 50 g/day of ground flaxseed can modestly reduce total cholesterol and low-density lipoprotein concentrations without altering triglycerides or high-density lipoprotein cholesterol.[34]

Lumnitzera racemosa (Family: Combretaceae; Common name: Black Mangrove). It is a handsome shrub or a small tree found on the coast of India and on the Andaman and Nicobar Island. According to folk medicine, the fruits of this plant are curative in skin disorders and useful for treating snake and insect bites. Antihypertensive action has been reported for the aqueous acetone extract of the plant. The antihypertensive activity of eleven hydrolysable tannins contained in the leaves of *L. racemosa* has been investigated. From the screening in spontaneously hypertensive rats, corilagin, castalagin, and chebulinic acid were identified as the major active substances.[35]

Lycopersicon esculentum **(**Family: Solanaceae; Common name: Tomato). Tomato extract contains carotenoids, such as lycopene, beta carotene, and vitamin E, which are known as effective antioxidants, to inactivate free radicals and to slow the progress of atherosclerosis. A study showed that extract of tomato modestly reduces BP in patients with mild, untreated HTN.[36]

Moringa oleifera (Family: Moringaceae; Common name: Murungai). In anesthetized rats, the crude extract of the leaves of *M. oleifera* caused a fall in systolic, diastolic, and mean BP in a dose-dependent manner. The antihypertensive effect was brief, returning to normal within two minutes. HR was not affected significantly, except at high doses (3 and 10 mg/kg), which produced a small degree of bradycardia. It was also established that thiocarbamate and isothiocyanate fractions of the crude extract were responsible for the antihypertensive activity.[37]

Ocimum basilicum (Family: Lamiaceae; Common name: Basil). It has been reported that a crude extract of *O. basilicum* causes a fall in systolic, diastolic, and mean BP in a dose-dependent manner with median effective dose of 30 mg/kg. The antihypertensive effect is brief and returns to normal within two minutes. This cardiovascular effect of the extract has been attributed to eugenol, which exerts its effect by blocking the calcium channels.[38]

Phyllanthus amarus (Family: Euphorbiaceae; Common name: Nela nelli). This plant is used as a diuretic and to lower BP in traditional medicine practice. The dose of 5 mg/kg produced the least hypotensive effect, causing a fall in mean diastolic, systolic, and the mean arterial.[39]

Punica granatum (Family: Lythraceae; Common name: Pomegranate). Pomegranate juice is becoming a more popular fruit drink. Research shows that pomegranate reduces the activity of angiotensin converting enzymes (ACE) by about 36%.[40]

Rauwolfia serpentina (Family: Apocynaceae; Common name: Sarpgandha). This endangered plant exploited for its great medicinal properties. This is considered to be the most powerful hypotensive plant. The extracted alkaloid Reserpine was the first potent drug widely used in the long-term treatment of HTN. Only a small dose is required to achieve results and to avoid side effects. In 1952, reserpine was introduced under the name Serpasil in the treatment of HTN, tachycardia, and thyrotoxicosis. The combination of reserpine, dihydroergocristine, and a diuretic is still on the market (Brinerdin, Crystepin).[41]

Sesamum indicum (Family: Pedaliaceae; Common name: Sesame). Sesamin and sesaminol are the major phenolic constituents of sesame oil. A study in hypertensive patients indicated that sesame oil consumption remarkably reduced oxidative stress and simultaneously increased glutathione peroxidase, superoxidase dismutase, and catalase activities. These results support the hypothesis that sesame oil consumption may help to enhance antioxidant defense system in human beings.[42]

Theobroma cacao (Family: Malvaceae; Common names: Chocolate, Cocoa Bean, Cocoa Butter). Cocoa powder, enriched with flavonoid constituents, is used for preventing cardiovascular disease. Flavonoids, contained in chocolate, stimulate formation of nitric oxide, increase vasodilatation, and reduce endothelial dysfunction. A growing body of clinical research also shows that daily consumption of dark or milk chocolate (*T. cacao*), 46 to 105 g daily, providing 213 to 500 mg of cocoa polyphenols, can lower systolic BP by about 5 mmHg and diastolic by about 3 mmHg.[43]

Uncaria rhynchophylla **(**Family: Rubiaceae; Common name: Cat's Claw herb). In traditional oriental medicine, *U. rhynchophylla* has been used to lower BP and to relieve various neurological symptoms. The hypotensive activity has been attributed to an indole alkaloid called *hirsutine*, which has been found to act at the Ca^{2+} channels.[44]

Viscum album (Family: Santalaceae; Common name: Mistletoe). The aqueous extracts of *V. album* leaves have shown significant coronary vasodilator activity. The mistletoe extract produces antihypertensive effect without alteration in HR.[45]

Withania somnifera (Family Solanaceae, Common name: Ashwagandha). This is a unique herb having antistress and adaptogenic action that leads to better physical fitness and helps cope with life's daily stress.[46] Hence it can be useful in treating hypertension. It is a strong sedative and tonic and has a rejuvenating effect on the body. It has biochemically heterogeneous alkaloids, which has shown great value when studied against bloodvascular muscles. *Withania somnifera* is reported to provide cardioprotection. It has anxiolytic and antidepressant actions.[47]

Zingiber officinale (Family: Zingiberaceae; Common name: Ginger). Ginger root is commonly used in Asian cooking. It acts to improve blood circulation and relaxes muscles surrounding blood vessels. Human trials for hypotensive effect of ginger have been few and generally used a low dose with inconclusive results.[48]

Table 1: List of plants used commonly for Cardiac disorders and high blood pressure.

S. N	Botanical Name	Family	Vernacular	Part Used
1.	*Abrus precatorius* L.	Fabaceae	Kaincha	Root
2.	*Allium sativum* Linn.	Liliaceae	Garlic, Rasuna	Clove
3.	*Alstonia scholaris* R.Br.	Apocynaceae	Chatiana	Bark
4.	*Boerhaavia diffusa* Linn	Nyctaginaceae	Puruni	Whole plant
5.	*Citrullus vulgaris* Sch.	Malvaceae	Water melon, Tarbuja	Roasted seed
6.	*Centella asiatica*	Apiceae	Thalkudi	whole plant
7.	*Emblica officinalis*	Euphobiaceae	Aonla	Fruit
8.	*Allium cepa* Linn.	Lilliaceae	Onion	Bulb
9.	*Celosia argentea*	Amaranthaceae	Mayurchulia	Leaves
10.	*Cinnamomum zeylanicum*	Lauraceae	Daalchini	Fruits
11.	*Chenopodium album*	Chenopodiaceae	Banapoi	whole plant
12.	*Asparagus racemosus*	Lilliaceae	Satavari	Whole plant
13.	*Ocimum sanctum* Linn.	Labiatae	Tulsi	Whole plant
14.	*Achyranthes aspera*	Amaranthaceae	Apamarga	Leaves
15.	*Flacourtia indica*	Flacourtiaceae	Kantacheura	Roots
16.	*Rauwolfia serpentine* Benth	Apocynaceae	Patalgaruda	Roots
17.	*Withania somnifera* (L.)Dunal	Solanaceae	Gadhapurna	Roots

CONCLUSION

The active effects of medicinal plants and synthetic compounds can indicate that medicinal plants and their effects and uses have never been disregarded. The active ingredients of medicinal plants including flavonoids and other phenolic compounds with antioxidant activity can scavenge free radicals and be effective against atherosclerosis, hypertension, stroke and various heart

ailments even which do not result in immediate symptoms. Phytochemicals are present in fruits and vegetables, it is important the consumption of this products in meals by all benefices that they have. The principal compounds are flavonoids; antioxidants (action in oxidative stress); ouabain; cardenolide glycosides; lanatosides; tannins; sesquiterpenoids and phenolic compounds. The consumption is also important by the effects in protection of cardiovascular diseases mainly because these diseases are the first cause of death in world. These herbals can be our answer to this deadly disease spreading to all sections of our society. Rigorous training of patients to take precautions and drug interactions into account and to avoid the arbitrary use of medicinal plants is also very important. There are many plants that have therapeutic effects, may prevent cardiovascular diseases, and influence hypolipidemia, blood pressure and heart failure through antioxidant, anti-clotting, hypotensive, anti-atherosclerosis, heart rate-regulating and vasodilating properties. We need to have these plants in our arsenal to fight against this killer disease.

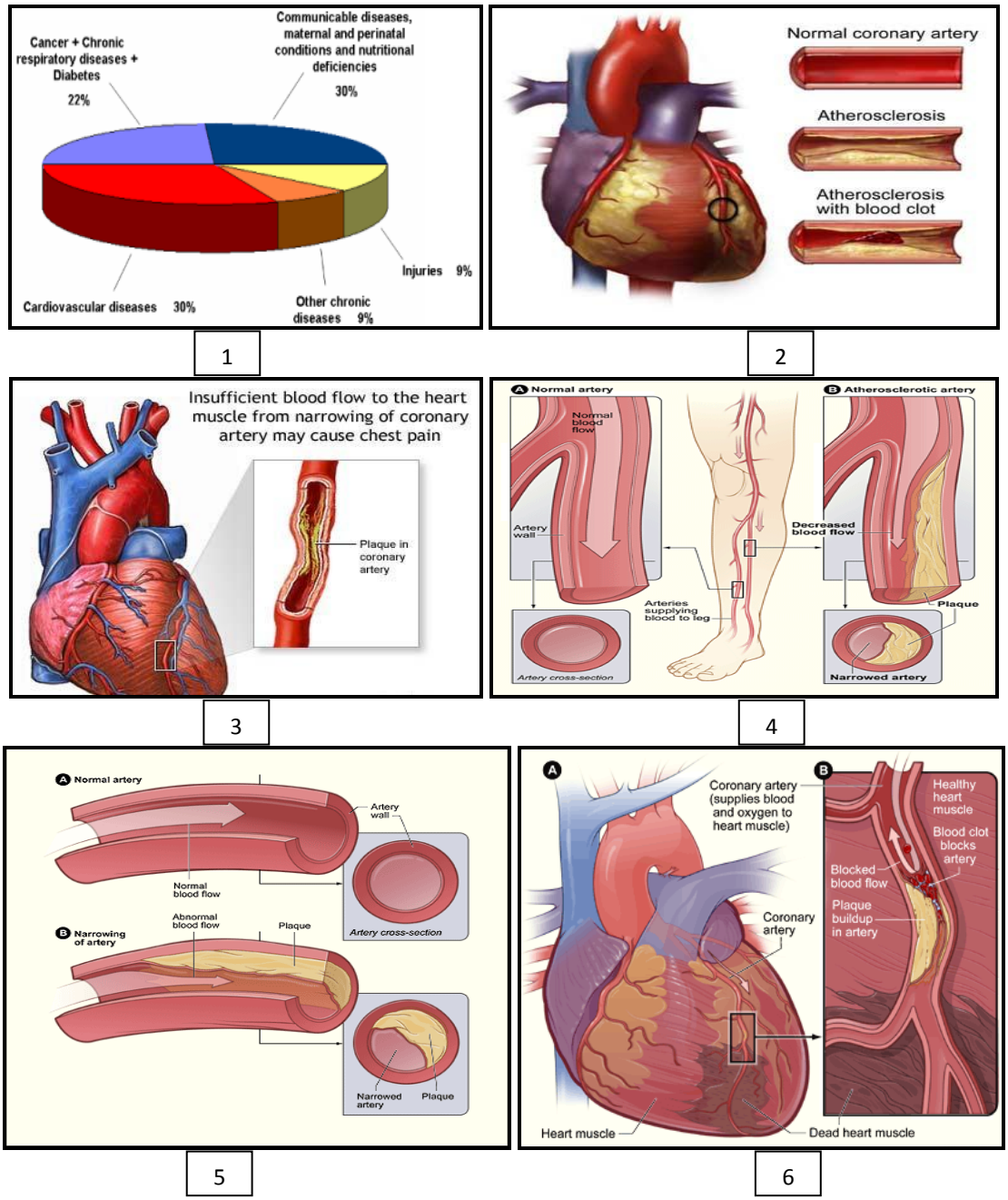

Fig-1 Report of World Health Organization (W.H.O), 2009 on Human Mortalities caused by different diseases in the World, Fig-2- Heart showing Antheroclerosis, Fig-3 Heart showing coronary artery spasm, Fig-4 Antherosclerotic artery showing Peripheral Arterial Disease, Fig-5 Heart showing muscle damage and a blocked artery, Fig-6 Artery of heart showing stroke or Transient Ischaemic Attack (TIA)[7]

REFERENCES

1. Vanhecke, T E, Miller WM, Franklin BA, Weber JE and Mc Cullough PA. Knowledge and Perception of Heart Disease. European Journal of Cardiovascular Prevention and Rehabilitation, 2006; 13(5): 718-723.
2. C. Disease: "The Glycemic Index Physiological Mechanisms Relating to Obesity, Diabetes, and Cardiovascular Disease." J. Am. Med. Assoc, 2002; 287: 2414–2423,
3. Obesity: preventing and managing the global epidemic. Report of a WHO consultation. World Health Organ Tech Rep Ser, 2000; 894: 1-253.
4. Vasan RS, Beiser A, Seshadri S, Larson MG, Kannel WB. Residual lifetime risk for developing hypertension in middle-aged women and men: The Framingham Heart Study. JAMA, 2002; 287: 1003-1010.
5. Asgary S, Sahebkar A, Afshani M, Keshvari M. Haghjooyjavanmard Sh, Rafieian-Kopaei M. Clinical evaluation of blood pressure lowering, endothelial function improving, hypolipidemic and anti-inflammatory effects of pomegranate juice in hypertensive subjects. Phytother Res., 2014; 28(2): 193-199.
6. A.R. Ness and J.W. Powles. Fruit and vegetables, and cardiovascular disease: a review. Int. J. Epidemiol, 1997; 26(1): 1–13,
7. Du Bose, T J, Cunyus, J. A. and Johnson L. Embryonic Heart, Rate and Age. *J.* Diagn Med Sonography, 2000; 6: 151-57.
8. Kearney PM, Whetom M and Reynolds K. Global Burden of Hypertension: Analysis of Worldwide Data. Lancet, 2005; 365: 217-223.
9. Murray CJL and Lopez A D Global Health Statistics: Global Burden of Disease and Injury Series, Vol I and Vol II. Boston. Harvard School of Public Health, 1996.
10. Josh P, Islam S and Pais P. Risk Factors for early myocardial infarction in South Asians compared with individuals in other countries. JAMA, 2007; 297: 286-294
11. WHO, Traditional Medicine Strategy WHO/EDM/TRM/2002.1. Geneva, Switzerland: World Health Organization, 2002–2005.
12. Law M, Wald N, Morris J. Lowering blood pressure to prevent myocardial infarction and stroke: a new preventive strategy. Health Technol Assess, 2003; 7(31): 1–94
13. Reinhart KM, Coleman CI, Teevan C, Vachhani P, White CM. Effects of garlic on blood pressure in patients with and without systolic hypertension: A meta-analysis. Ann Pharmacother, 2008; 42: 1766–71
14. Ried K, Frank OR, Stocks NP, Fakler P, Sullivan T. Effect of garlic on blood pressure: A systematic review and meta-analysis. BMC Cardiovasc Disord, 2008; 8: 13.
15. Hasrat JA, Pieters L, Vlietinck AJ. Medicinal plants in Suriname. J Pharm Pharmacol, 2004; 56: 381–7.
16. Gharooni M, Sarkarati AR. Application of *Apium graveolens* in treatment of hypertension. Tehran Univ Med J, 2000; 58: 67–9.
17. Burke V, Hodgson JM, Beilin LJ, Giangiulioi N, Rogers P, Puddey IB. Dietary protein and soluble fiber reduce ambulatory blood pressure in treated hypertensives. Hypertension, 2001; 38: 821–6.
18. Keenan JM, Pins JJ, Frazel C, Moran A, Turnquist L. Oat ingestion reduces systolic and diastolic blood pressure in patients with mild or borderline hypertension: A pilot trial. J Fam Pract, 2002; 51: 369.
19. Gaitonde B B, Kulkarni HJ and Nabar SD. Diuretic activity of Punarnava *(Boerhaavia diffusa).* Bulletins of the Haffkine Institute, Bombay, India, 1974; 2: 24-28.
20. Thakur RS, Puri HS and Hussain. Major Medicinal Plants of India, CIMAP (Central Institute of Medicinal and Aromatic Plants), U.P, 1989; 116-23.
21. Yang YC, Lu FH, Wu JS, Wu CH, Chang CJ. The protective effect of habitual tea consumption on hypertension. Arch Intern Med., 2004; 164: 1534–40.
22. Gilani AH, Aftab K. Hypotensive and spasmolytic activities of ethanolic extract of *Capparis cartilaginea*. Phytother Res., 1994; 8: 145–8.
23. Ajagbonna OP, Mojiminiyi FBO, Sofola OA. Relaxant effects of the aqueous leaf extract of *Cassia occidentalis* on rat aortic rings. Afr J Biomed Res., 2001; 4: 127–9.
24. Dubey MP, Srimal RC, Nityanand S, Dhawan BN. Pharmacological studies on coleonol: A hypotensive diterpene from *Coleus forskohlii*. J Ethnopharmacol, 1981; 3: 1–13.
25. Hasrat JA, Pieters L, Vlietinck AJ. Medicinal plants in Suriname. JPharm Pharmacol, 2004; 56: 381–7.
26. Mashour NH, Lin GI, Frishman WH. Herbal medicine for the treatment of cardiovascular disease: Clinical considerations. Arch Intern Med., 1998; 158: 2225–34.
27. Bensky D, Gamble A. USA: Eastland Press; Chinese Herbal Medicine, 1990.
28. Gilani A H, Aftab K. Pharmacological Actions of *Cuscuta reflexa*. Informa healthcare, 1992; 4: 296–302.
29. Gilani AH, Shaheen E, Saeed SA, Bibi S, Irfanullah, Sadiq M, Faizi S. Hypotensive action of coumarin glycosides from *Daucus carota*. Phytomedicine, 2000; 7: 423–6.
30. Ho CS, Wong YH, Chiu KW. The hypotensive action of *Desmodium styracifolium* and *Clematis chinensis.* Am J Chin Med., 1989; 17: 189–202.
31. Chaudhari and Ratan, K. Standardised extract of *Phyllanthes emblica*: A skin lightener with antiageing benefits, proceedings PCIA conference, Guangzhou, China, 2004.
32. Nadkarni, K. M. The Indian Materia Medica, with Ayurvedic, Unani, Tebbi, Siddha, Allopathic, Homeopathic, Naturopathic and Home-remedies.

Revised and enlarged by A.K. Nadkarni, Popular Prakashan, Private Ltd., Bombay, India, 1954.
33. Gilani AH, Aziz N, Khan MA, Shaheen F, Jabeen Q, Siddiqui BS. Ethnopharmacological evaluation of the anticonvulsant, sedative and antispasmodic activities of *Lavandula stoechas* L. J Ethnopharmacol, 2000; 71: 161–7.
34. Bloedon LT, Szapary PO. Flaxseed and cardiovascular risk. Nutr Rev., 2004; 62: 18–27.
35. Cheng JT, Lin TC, Hsu FL. Antihypertensive effect of corilagin in the rat. Can J Physiol Pharmacol, 1995; 73: 1425–9.
36. Engelhard YN, Gazer B, Paran E. Natural antioxidants from tomato extract reduce blood pressure in patients with grade-1 hypertension: A double-blind, placebo-controlled pilot study. Am Heart J., 2006; 151: 100.
37. Faizi S, Siddiqui BS, Saleem R, Aftab K, Shaheen F, Gilani AH. Hypotensive constituents from the pods of *Moringa oleifera*. Planta Med., 1998; 64: 225–8.
38. Azhar I, Aftab K, Usmanghani K. Naturally occurring calcium channel blockers. Hamdard Medicus, 1995; 38: 5–16.
39. Amaechina FC, Omogbai EK. Hypotensive effect of aqueous extract of the leaves of *Phyllanthus amarus* Schum and Thonn (Euphorbiaceae) Acta Pol Pharm, 2007; 64: 547–52.
40. Aviram M, Dornfeld L. Pomegranate juice consumption inhibits serum angiotensin converting enzyme activity and reduces systolic blood pressure. Atherosclerosis, 2001; 195–8.
41. Jerie P. Milestones of cardiovascular therapy: IV, Reserpine. Cas Lak Cesk., 2007; 146: 573–7.
42. Nakano D, Itoh C, Takaoka M, Kiso Y, Tanaka T, Matsumura Y. Antihypertensive effect of sesamin IV Inhibition of vascular superoxide production by sesamin. Biol Pharm Bull., 2002; 25: 1247–9.
43. Taubert D, Berkels R, Roesen R, Klaus W. Chocolate and blood pressure in elderly individuals with isolated systolic hypertension. JAMA., 2003; 290: 1029–30.
44. Horie S, Yano S, Aimi N, Sakai S, Watanabe K. Effects of hirsutine, an antihypertensive indole alkaloid from *Uncaria rhynchophylla*, on intracellular calcium in rat thoracic aorta. Life Sci., 1992; 50: 491–8
45. Tenorio FA, del Valle L, Pastelin G. Vasodilator activity of the aqueous extract of *Viscum album*. Fitoterapia, 2005; 76: 204–9
46. Singh, N., Nath, R. and Lata, A. *Withania somnifera* (Ashwagandha), a reguvenating herbal drug which enhances survival during stress (an adaptogen). Int. J Crude Drug Res., 1982; 20: 29-35.
47. Mohanty, I. R., Arya, D.S. and Gupta, S. K. Clin Nutr, 2008; 27(4): 635-42.
48. Nicoll R, Henein MY. Ginger (*Zingiber officinale* Roscoe): A hot remedy for cardiovascular disease? Int J Cardiol, 2009; 131: 408–9.