Systematic Review

Exploring the Impact of Medicinal Plants on Cardiac Health Compared to Standard Pharmaceuticals Available in Bangladesh: A Systematic Review

ABSTRACT

Aims: Medicinal plants have long been an essential part of healthcare in many cultures with a variety of bioactive chemicals that contribute to different pharmacological effects. Crude medicines, which are frequently refined or utilized in their natural state to treat a variety of ailments, can be derived from these plants. The potential of medicinal plants in medication development and discovery has been acknowledged more and more by contemporary scientific research, especially when it comes to disorders for which there are few available treatments. Numerous chemicals originating from plants have been found to possess antibacterial, anti-inflammatory, antioxidant, and cardioprotective qualities, making them potential candidates for use in pharmaceutical applications.

Methodology:
By exploring several published articles in reputed journals, we have listed out the medicinal plants available in Bangladesh that have various pharmacological effects, especially in cardiovascular health, and tried to compare them with the available pharmaceutical drugs in the Bangladesh market that are being widely used as blood thinner and lipid-lowering agents.

Results: Twenty-one medicinal plants have been found to have positive effects on cardiovascular health. On the other hand, despite being effective in their intended pharmacological actions, traditional cardiovascular medications including lipid-lowering medicines and anticoagulants are frequently linked to a variety of adverse effects. This presents a significant chance to investigate these medicinal plants' potential as alternative or complementary therapies that might provide comparable therapeutic advantages with fewer side effects.

Keywords: Anti-coagulation, hypolipidemic, cardiovascular, lipid-lowering agent.

INTRODUCTION

The plants that have therapeutic properties or exert helpful medicinal impact on the living bodyare usually referred to as “Medicinal Plant’’(World Health Organization, 2006). According to the World HealthOrganization, A medicinal plant is any plant that in one or a lot of its organs, contains substances that will be used for therapeutic functions or that could be a precursor for the synthesis of helpfulmedication(World Health Organization, 1991). Medicinal plants could also be outlined as a bunch of plants that possess somespecial properties or virtues that quality then as articles of medicine and therapeutic agents andsquare measures used for healthful functions(Griggs, 1997). Medicinal plants are used as natural medicinal products.This observation has been occurring since prehistoric times(Li,

2000).Modern approaches to deciding the medicinal properties of plants involve cooperative efforts that will embody anthropologists, pharmacists, pharmaceuticals, chemists, and physicians(Bailey, 2002).

HISTORY OF MEDICINAL PLANTS

Medicinal plants are a large group of plants that are used for therapeutic or prophylactic purposes in medicine or veterinary practice. Literary sources attest to the use of medicinal plants in the early years of the Common Era in ancient Assyria, Egypt, India, and China around 3000 B.C., Iran, Greece, and Rome, and in the Middle Ages in Arab countries, Middle Asia, Georgia, Armenia, and Europe(Griggs, 1997; Li, 2000). After the formation of the AptekarskyPrikaz (pharmaceutical department) at the beginning of the 17th century, the gathering of medicinal herbs in Russia was organized and their cultivation began(Bailey, 2002; World Health Organization, 2006).

AVAILABLE MEDICINAL PLANTS IN BANGLADESH

Bangladesh has more than 700 medicinal plant species. In Bangladesh, these plants are a habitatand the use of medicinal plants here is growing day by day. More than 80% of people here reside inrural areas and use these medicinal plants as primary healthcareitems. Bangladesh is home tonearly 6500 plant species. The Bangladesh National Herbarium (BNH) first drafted a list of 192species of plants in our country. BNH has published a pictorial book on 700 plant species usedby local people living in the Chittagong Hill Track area. The Bangladesh Agricultural Research Institute (BARI) reports that 722 different types of medicinal plants may be found in Bangladesh. Bangladesh uses 700 plants for medical reasons, compared to 4,000 in India. 255 of these plants are used by producers of Unani and Ayurvedic medications(Alam, 2010; Rahman, 2006).

STATUS OF MEDICINAL PLANTS IN WORLD MARKET

China, France, Germany, Italy, Japan, Spain, the UK, and the US are the main global markets for MAPs. Japan has the highest botanical medicine intake per capita in the world. The International Council for Medicinal and Aromatic Plants predicts global growth to be about 8-10 percent per year in 2001 and 2002. The world demand for herbal medicines was US$19.4 billion in 1999, with Europe leading the way (US$6.7 billion), followed by Asia (US$5.1 billion), North America (US$4.0 billion), Japan (US$2.2 billion) and the rest of the world (US$1.4 billion). Japan's botanical medicine market was estimated at US$2.4 billion in 1996(Griggs, 1997; Li, 2000; World Health Organization, 2006).

STATUS OF CARDIOVASCULAR DISEASES IN BANGLADESH:

In Bangladesh, cardiovascular diseases are an extremely prevalent contributor to death.Understanding this fact, both the government and private sectors are working hard to tackle these diseases. In recent decades, important progress has been made in the management of cardiacdiseases in the world.New medical and therapeutic methods are routinely implementedto keep pace with the environment. In addition to these pharmacological treatments, almost allkinds of interventional management are being practiced in the region. In Bangladesh, exceptfor a few complex surgeries, major cardiac and vascular surgeries are now possible. In addition, cardiac care centers, previously confined to the capital city, are now beingdecentralized all over the world. The recommended population of cardiologists by variousauthorities is 2.6-4.2/100,000; the ratio in Bangladesh in 2007 was around 0.27/100,000, whichis very inadequate. The average population ratio of bedsin the coronary care unit is 4-5/100,000; the ratio in Bangladesh was about 0.13/100,000 in 2007, which is again insufficient. However, the number of qualified specialists, hospitals, and cardiovascular treatment institutionsis rising rapidly in Bangladesh. Hopefully, we will achieve a global standard soon.The primary cause of death has been non-

communicable diseases (NCDs) in Bangladesh. NCDcaused 74 percent of the deaths in 2014. The overall prevalence of smoking is 26.2 percent. 18% of adults suffer from hypertension and 4% have diabetes mellitus (Rahman et al., 2010; WHO, 2014; Bangladesh Heart Foundation, 2015).

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RESULT:

A systematic review of some Medicinal plants of Bangladesh which have beneficial activity on Cardiovascular Health. 21 medicinal plants have been chosen for the systematic review from reputed journals that have bioactive compounds and pharmacological activity on Cardiovascular Health problems. I have also listed available anticoagulation and hypolipidemic in the market. These data have been collected by visiting pharmacy shops in various regions.

Table 1: Plants that have cardiovascular effects:

Plant Scientific Name	Local Name	Parts Used	Bioactive compounds	Common Pharmacological Activity	Specific Cardiac Activity	Ref.
1.Cynara scolymus	Globe artichoke and Garden artichoke	Leaves	Inulin, minerals, vitamins, fiber, polyphenols	Hypolipidemic, antiatherogenic, hepatoprotective, antioxidant	Hypolipidemic activity	(Morazzoni, 2006)
2.Allium sativum	Garlic	Fruit	Allicin, Flavonoid, Alkaloid	Anti-microbial, antioxidant, anti-inflammatory, anticancer, anti-Alzheimer's, anti-obesity, anti-hypertensive, Antiatherosclerosis, Antithrombotic	Anti-hypertensive, Antiatherosclerosis, Antithrombotic	(Ryu,2012)
3.Allium hirtifolium	Wild garlic	Fruit	Dimethyl trisulfide, methylthioether disulfide, thymol, carvacrol, tris methane, chloroorcylaldehyde	Hypotensive, Anti-Atherosclerotic, Antithrombotic or Anti-aggregatory, Hypoglycemic, Anti-inflammatory Antidiabetic, antibacterial, antifungal	Atherosclerotic, Antithrombotic or Anti-aggregatory, Hypoglycemic	(Gachkar,2010)
4.Crocus sativus L	Saffron	Stigma	Ceocetin, safranal, picrocrocin	Anti-Alzheimer's, antitussive, hypolipidemic, anticonvulsant, antinociceptive, anti-inflammatory	Hypolipidemic activity	(Moshiri,2010)

5.Cinnamomum cassia (L.)	Chinese cinnamon	Bark	Terpenes, phenylpropanoids, lignans, flavonoids, aromatic compounds, aliphatic compounds, coumarins, steroids	Anticoagulant, anti-obesity, immunoregulation, Anticoagulant, insecticidal and cardiovascular acaricidal, protective cardiovascular protective, cytoprotective	Anti-obesity, Anticoagulant, cardiovascular protective	(Khan,2012)
6.Artemisia dracunculus L.	Tarragon	Leave	1,8-Cineole, camphor, camphene, borneol, thymene, terpinene-4-ol, γ-terpinene, α-terpineol, caryophyllene oxide, β-pinene, α-pinene, β-myrcene, limonene	Anti-inflammatory, antipyretic, antiseptic, antispasmodic, antiparasitic, anticoagulant, antimicrobial, anthelmintic, fungicidal	Anticoagulant	(Mistry,2013)
7.Cyamopsis tetragonoloba	Guar	Seeds	Gum residues, saponins, polyphenols	Anticoagulant, anti-diabetic, hemolytic, Anti-ulcer, Cytoprotective, Anticholinergic, Hypoglycemic, Hypolipidemic, Antimicrobial, anti-inflammatory	Anticoagulant, Hypolipidemic	(Prakash,2015)
8.Pulmonaria o□cinalis	Lungwort	aerial parts	Flavonoids, vitamin C, B-complex; minerals-iron, copper, silver, manganese and nickel	Anticoagulant, astringent, Antioxidant activity, acetylcholinesterase, tyrosinase inhibitory	Anticoagulant	(Galić,2011)
9.Petroselinum crispum	Cambodia	aerial parts	Flavonoids, dihydroxycoumarin, apiin, apigenin	Anticoagulant, carminative, antioxidant, immunomodulant, anti-spasmodic, diuretic, antirheumatic, antimicrobial, laxative	Anticoagulant	(Emami,2012)
10.Tridax procumbens	Coatbuttons and tridax daisy	Leave	Bis-bithio-phene, oleonic acids, lupeol, beta-amyrenone and taraxas-teryl acetate	Anticoagulant, anti-inflammatory, antiviral, anti-oxidant, antibiotic.	Anticoagulant	(Chattopadhyay,2014)

11.Filipendula ulmaria	meadows weet	leaves, roots and flower	flavonoids, vitamins, tannins, polyphenols, ellagitannins, phenolic acids, methyl gallate 3-O-beta-glucoside and rugosins	Anticoagulant and anti-inflammatory.	Anticoagulant	(Esmaeili,2016)
12.Paeonia anomala	Anomalous peony	Fruits and roots	acetophenone, ellagic acid, tert-butylhydroperoxide, methyl gallate, ethyl gallate, fischeroside B and quercetin derivatives.	Anticoagulant, antithrombotic, thrombolytic	Anticoagulant	(Zhang,2017)
13.Ferula communis	Giant fennel	Leave	ferulenol, fert-din, anisate, oxajaeskeanadioyl and costic acid	Anticoagulant, antioxidant and anti-hemolytic	Anticoagulant	(El-Sherif,2019)
14.Panax notoginseng	Chinese ginseng	Roots	ginsenoside Rh4, ginsenoside Rh1, notoginsenoside S, notoginsenoside T ginsenoside Re, notoginsenoside R1 and ginsenoside Rd	Anticoagulant, anti-hemorrhagic, anti-hypertensive, anti hypercholestrolemic	Anticoagulant, anti-hypertensive and hypercholestrolemic	(Zhang,2017)
15. Thymas vulgaris	German thyme	Leaves and flower	thymol, b-caryophyllene, linalool, a-terpinene	Anticoagulant, antiseptic, antifungal	Anticoagulant	(Rahman,2019)
16. Ginko biloba	Ginkgo	Leave	Phenolic acids, proanthocyanidins, flavonoid, glycosides,	Anticoagulant, neuroprotective	Anticoagulant	*(Lee,2017)*
17. Harpagophytum procumbens	grapple plant, wood spider, devil's claw	Leave	Iridoid glycosides, phytosterols, aromatic acids and flavonoids	Hypolipidemic activity, analgesic, anti-oxidant, anti-diabetic, antiepileptic, antimicrobial, antimalarial	Hypolipidemic activity	*(Glombitza,1999)*
18. Amaranthus spinosus	spiny amaranth, spiny pigweed, prickly amaranth	Leaves	Alkaloids, carbohydrates, cardiac glycosides, flavonoids, phenol, aminoacid, proteins, saponins, tannins	Hypolipidemic activity, hepatoprotective, antioxidant, anti-diabetic, anti-inflammatory	Hypolipidemic activity	*(Akindahunsi,2010)*

19. Glycyrrhiza glabra	Liquorice	Roots	alkaloids, glycosides, flavonoids, phenolics, saponins, tannins, terpenes, anthraquinones, essential oils, steroids	Hypolipidemic, neuroprotective, antioxidant, sedative, anti-depressive, antimicrobial, antiviral, skin effects, anti-inflammatory, anti-ulcer, anti-tumor, hepatoprotective	Hypolipidemic activity	(Mohamed,2014)
20. Withaniasomnifera	Poisonous gooseberry	Roots	steroidal lactones, alkaloids, flavonoids, tannin	Hypolipidemic, anti-inflammatory, anticancer, chemoprotective, immunomodulatory, anti-oxidant	Hypolipidemic activity	(Choudhary,2008)
21. Chlorophytum borivilianum	Safed Musli	Roots	Carbohydrates, gums, mucilage, glycosides, phenolic compounds, proteins, amino acids, saponins, steroids, sterols, terpenes	Hypolipidemic, immunomodulatory, anticancer, anti-inflammatory, antioxidant, hypolipidemic activity	Hypolipidemic activity	(Tiwari, 2010)

Table 2: Available anti-coagulant drugs in the market

Agents	Class	Route of Administration	Mechanisms	Major side effects
1.Ticlopidine	Thienopyridine	Oral	Irreversibly blocks the P2Y12 component of the ADP receptor on the surface of platelets	Diarrhea, stomach upset, nausea, vomiting, dizziness
2.Clopidogrel	Thienopyridine	Oral	The active metabolite specifically and irreversibly inhibits the P2Y12 subtype of ADP receptor	Stomach ache or abdomen pain, nosebleed, increased bleeding
3.Prasugrel	Thienopyridine	Oral	Reduce the aggregation ("clumping") of platelets by irreversibly binding to P2Y12 receptors	Bleeding, anemia, atrial fibrillation, back pain, slow heart rate
4.Aspirin	Nonsteroidal anti-inflammatory drug (NSAID)	Oral	Decreased production of prostaglandins and TXA2	Rash, gastrointestinal ulcerations, abdominal pain,

				upset stomach
5.Cangrelor	ATP analogue	IV	Reversibly inhibit P2Y12 receptors	Allergic reactions, severe bleeding, anaphylaxis
6.Ticagrelor	Cyclopentyltriazolopyrimidine	Oral	Blocks adenosine diphosphate (ADP) receptors of subtype P2Y12	Bruising, bleeding more easily, nosebleeds, headache, dizziness
7.Dabigatran	Direct thrombin inhibitors	Oral	Binds to the active site on the thrombin molecule, preventing thrombin-mediated activation of coagulation factors	Nausea, abdominal or stomach pain, stomach upset, indigestion, heartburn
8.Apixaban	Factor Xa inhibitors	Oral	Reversibly direct inhibition of free and clot-bound factor Xa	Headache, dizziness, weakness
9.Rivaroxaban	Factor Xa inhibitors	Oral	Inhibits both free Factor Xa and Factor Xa bound in the prothrombinase complex	Back pain, bloody stools, bowel or bladder dysfunction, burning, crawling, itching
10.Edoxaban	Factor Xa inhibitors	Oral	Selective, reversible and competitive inhibitor of human factor Xa	Bleeding that takes longer to stop, bruising more easily, skin rash, reduced liver function
11.Warfarin	Vitamin K antagonist	Oral	Inhibits the vitamin K-depended synthesis of biologically active forms of the clotting factors II, VII, IX and X	Severe bleeding, including heavier than normal menstrual bleeding, red or brown urine, black or bloody stool, severe headache or stomach pain
12. Heparin	Antithrombotic	Oral	Binds to the enzyme inhibitor antithrombin III	Bleeding and swelling, discomfort, redness, warmth, irritation, or changes in the skin where the medication was administered

Table 3: Available lipid-lowering drugs in the market

Agents	Class	Route of Administration	Mechanisms	Major side effects
1. Atorvastatin	Statin	Oral	A competitive inhibitor of HMG-CoA reductase	Joint pain, insomnia, urinary tract infection, nausea.
2. Fluvastatin	Statin	Oral	Blocks the liver enzyme HMG-CoA reductase	stomach upset or pain, indigestion, nausea, muscle pain
3. Lovastatin	Statin	Oral	Inhibits 3-hydroxy-3-methyl glutaryl-coenzyme A reductase (HMG-CoA reductase)	Pain in the stomach area, nausea, heartburn, constipation.
4. Pitavastatin	Statin	Oral	Inhibitor of HMG-CoA reductase, the enzyme that catalyzes the first step of cholesterol synthesis	Muscle pain, back pain, joint pain, constipation.
5. Pravastatin	Statin	Oral	Inhibits the function of hydroxy methyl glutaryl-CoA (HMG-CoA) reductase	Muscle pain, nausea, vomiting, diarrhea.
6. Rosuvastatin	Statin	Oral	Works by inhibiting HMG-CoA reductase	Headache, muscle pain.
7. Simvastatin	Statin	Oral	Acts by inhibiting 3-hydroxy-3-methylglutaryl (HMG) coenzyme A reductase.	Headache, difficulty sleeping, flushing of the skin.
8. Bezafibrate	Fibrates	Oral	An agonist of PPARα	Stomach upset, gas, nausea, itchy skin, redness.
9. Clofibrate	Fibrates	Oral	Increases the activity of extrahepatic lipoprotein lipase (LL), thereby increasing lipoprotein triglyceride lipolysis	Headache, muscle aches and gastrointestinal upset.
10. Fenofibrate	Fibrates	Oral	Enhanced catabolism of triglyceride-rich particles and reduced secretion of VLDL	Headache, back pain, nausea, indigestion.
11. Gemfibrozil	Fibrates	Oral	Inhibits lipolysis and decrease subsequent hepatic fatty acid uptake	Stomach pain, indigestion, diarrhea.

12. Niacin	Pyridine carboxylic acid	Oral	Reduces the synthesis of low-density lipoprotein cholesterol (LDL-C), very low-density lipoprotein cholesterol (VLDL-C), lipoprotein(a), and triglycerides, and increases high-density lipoprotein cholesterol	Severe skin flushing combined with dizziness, rapid heartbeat, Itching, nausea and vomiting.

Discussion

This systematic analysis of local Bangladesh medicinal plant data shows 21 plants areavailable in this country which is beneficial for cardiac health and several pharmaceutical agentsare available for the treatment of blood coagulation and obesity. Judging from this plant source we canassume that plants that are available in South Asia have more beneficial effects on cardiovascular health. Various drugs are available for anticoagulation and lipid-lowering activitywhich have various side effects. To avoid these side effects natural sources can be used in thiscase. Further study is needed to isolate more cardiovascular drugs from plant sources.

Conclusion:

Plants have played an important role in the world of medicine since ancient times. A significantpotential source of therapeutics or curative aids has been described as medicinal herbs or plants. My systemic data shows that 21 medicinal plants that benefit cardiac health are available in our country. On the other hand, available drugs for the treatment of these diseases have so many side effects which can beignored by using medicinal plants.

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