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FABRICATION OF AN HERBAL TEA: NATURAL REMEDIES FOR TREATMENT OF HYPERTENSION & ATHEROSCLEROSIS

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ABSTRACT

Hypertension is a widespread trouble facing a lot of people's today, although billions of dollars are spent annually for the treatment and recognition of cardiovascular disease, current conventional treatments have done little to reduce the number of patients with hypertension. Alternative medicine offers an effective way to decrease the rising number of people with high blood pressure. Research has found a variety of substitute therapies to be flourishing in dropping high blood pressure including diet, exercise, stress, management, supplements and herbs. Different strategies developed to relieve the risk factors covering gene therapy, synthetic antioxidants, vitamins and drugs, but atherosclerosis is still a leading cause of death worldwide. Actual aim of this project work was to prepare mixtures of powders from natural origin, most commonly collected from plants or herbal and also from biological sources to treat the hypertensive patients, and that will be supplied with in a tea bag, they can easily intake it just like a tea. Drinking of anti- hypertensive herbal tea (fabricated with various mixtures of powder like, arjuna bark, cardamom, ginger, garlic, sarpgandha, cloves etc.) instead of regular tea may very helpful for the ability to help reducing the high blood pressure and combat hypertension and keeps the heart healthy and fit and a good start of day with numerous other health benefits. Goodness of Honey and widely acceptable flavor of cardamom which are also medicinally for treating hypertension plays a very significant role in providing taste, flavor and fragrance makes it a pre-eminent anti-hypertensive herbal tea.

Keywords: Herbal tonic, Hypertension, Curcumin, arjuna, cardamom, garlic, High Blood Pressure.

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INTRODUCTION

Hypertension, or chronically elevated blood pressure (BP) (systolic/diastolic BP [SBP/DBP] $140/90 mmHg at the brachial artery), is a multi-factorial condition implicated in the development and progression of cardiovascular disease. Hypertension is among the most important modifiable risk factors for cardiovascular disease [1]. High BP affects nearly 1 billion people globally and about 30% of adults in Western countries.1 An estimated 70% heart attacks, strokes, and chronic heart failure are attributed to hypertension, leading to 37% of cardiovascular deaths in Western countries and 13.5% globally [2,3].

Epidemiological studies have indicated a continuous association between BP and cardiovascular risk, suggesting that a reduction of high systolic BP (SBP. 140 mmHg) by 20 mmHg or a reduction of high diastolic BP (DBP. 90 mmHg) by 10 mmHg is associated with a 50% risk reduction in developing cardiovascular disease [4]

Every year, more and more studies are being performed on herbal remedies for high blood pressure. There are many herbal drugs like Punarnava, Barberry, Rouwolfia, Garlic, Ginger, Ginseng and Arjuna which can safely use for the treatment of hypertension. This review highlight the herbs proved scientifically for the treatment of hypertension.

Natural products from plants, animals and minerals have been the basis of the treatment of human disease. Today estimate that about 80 % of people in developing countries still relays on traditional medicine based largely on species of plants and animals for their primary health care. Herbal medicines are currently in demand and their popularity is increasing day by day. About 500 plants with medicinal use are mentioned in ancient literature and around 800 plants have been used in indigenous systems of medicine. India is a vast repository of medicinal plants that are used in traditional medical treatments [5].

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There has been an increase in demand for the Phytopharmaceutical products of Ayurveda in Western countries, because of the fact that the allopathic drugs have more side effects. Many pharmaceutical companies are now concentrating on manufacturing of herbal and Phytopharmaceutical products [6].

In India, around 20,000 medicinal plants have been recorded. Chemical principles from natural sources have become much simpler and have contributed significantly to the development of new drugs from medicinal plants [7-9].

Chemical Classification of Antihypertensive Herbs [10]:

- Alkaloids- Rauwolfia, Papaver, Avis tolochladebis, Loptis, jayonica, Withenia, Golden seal, Bhringaraj
- Terpenoids- Jatamansi, Inula helenicum. Arnica montana, Coleus, Jalbrahmi, Black cohosh forskohlii, Sania syriaca
- Steroid- Veratrum, Holarrhena pubescens, satavari, bhringraj ,Clerodendroon trichotomum
- Flavanoids -Devis scandens, Mitragyna ciliate, Yaroow, Olive leaf, Hawthorn, Arjuna, Ginkgo, Vitis vinifera, Alpinia
- Volatile Oil - Black cumin seed, Ginger
- Sterols - Cat's claw
- Tannin- African mistletoe, Arjuna

Pharmacological Classification of Antihypertensive Herbs:

- Centrally Acting- Withania (CNS acting); Rauwolfia (catcholamine depeleters); Hypericum (dopamine and norepinephrine reuptake inhibitors); Black cumin seed (CNS acting and antioxidant)
- Vasodialators- Garlic (via hyperpolarisation through H2S); Ginseng (direct smooth muscle relaxant); Hawthorn, Vitis, Yarrow, Olive leaf (endothelium dependent vasodilation); Forskolin (Adenyl cyclase pathway), Lotus
- Diuretic –Punarnava
- ACE Inhibitors- Garlic (by allicin)
- Cholesterol Synthesis Inhibitors- Cat's claw, African mistletoe.

Atherosclerosis is a chronic disease occurring in the inner lining of arterial walls due to the progressive plaque formation [11]. Multiple risk factors are implicated in the pathogenesis of atherosclerosis, including oxidative stress, inflammatory responses, hypercholesterolemia, hypertension, diabetes and cigarette smoking [11-13]. The factors are interrelated and their interactions may intensify the chronic disease [11, 14]. Different strategies developed to relieve the risk factors covering gene therapy, synthetic antioxidants, vitamins and drugs, but atherosclerosis is still a leading cause of death worldwide [11].

Actual aim of this project work was to prepare mixtures of powders from natural origin, most commonly collected from plants or herbal and also biological sources to treat the hypertensive patients, and that will be supplied with in a tea bag, they can easily intake it just like a tea.

MATERIALS AND METHOD

MATERIALS

All the materials used to prepare herbal tonic were collected from local vendors and it was dried in oven then powdered in the lab.

Powdered material used for carrying out the research work

1. Arjuna barks
2. Cardamom
3. Sarpgandha roots
4. Turmeric Roots
5. Garlic
6. Cloves
7. Ginger
8. Honey

1. ARJUNA

Scientific name: *Terminalia arjuna*
Family: *Combretaceae*
Plant's Part Used: Barks

Fig. 1: Various parts of *Terminalia arjuna, including whole plant, fruits, barks & its powder form.*

The plant *Terminalia arjuna* L. commonly known as arjuna, a remarkable tree for its important phytochemicals, belongs to the family combretaceae or the terminalia family [15]. The plant is very rich source of natural antioxidants due to which it has been extensively investigated for its uses in both Ayurvedic and Yunani systems of medicine [15, 16]. In Ayurvedic system, it is styptic, anthelmintic, alexiteric, tonic, and useful in fractures, heart diseases, urinary discharges, biliousness, ulcers, asthma, tumors, anemia and excessive perspiration etc. according to the Yunani medicine system [17].

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Arjuna is used both externally and internally in gleets and urinary discharges as well as expectorant, aphrodisiac, tonic and diuretic [18]. *Terminalia arjuna* based phytochemicals are considered as one of the best heart tonic [15] therefore, it can be used on daily bases as tonic for healthy cardiovascular system. The active components of *Terminalia arjuna* are tannins, triterpenoid saponin (arjunic acid, arjunolic acid, arjungenin, and arjunglycosides) [19]. Flavonoids (arjunone, arjunolone, luteolin), gallic acid, ellagic acid, Oligomeric Proanthocyanidines (OPCs), phytosterols, calcium, magnesium, zinc and copper [18].

Priya N *et al.* [20] studied to observe the effect of *Terminalia arjuna* on total platelet count, lipid profile, clinical parameters in patients of coronary artery disease (CAD) and their usefulness in the same patient group. Materials and Methods: One hundred patients having CAD were selected and randomized to study group (to receive Arjuna Chhal Powder) and control group (not receiving any medication). After the therapy of 1 month with Arjuna Chhal Powder, patients of both study and control groups evaluated for body weight, blood pressure, pulse rate, total platelet count and lipid profile. Observations were analyzed with use of appropriate statistical test. We observed 0.22% decrease in body weight in study group although insignificant. The systolic blood pressure decreased by 10.28% and diastolic blood pressure by 4.8% in the study group which was statistically significant in comparison to control group. Lipid profile improved with 10.2% reduction in total cholesterol level, 17.9% reduction in serum triglyceride level, 9.59% reduction in serum low-density lipoprotein (LDL) level, 16% reduction in serum very LDL level and 10.48% increase in serum high-density lipoprotein level, all being statistically significant. *T. arjuna* bark extract can significantly reduce blood pressure and favorably modify lipid profile. It might also have antioxidant properties and may be beneficial for cardiac as well as overall health.

RECOMMENDED DOSAGE OF ARJUNA [21]

Arjuna Powder -2-3 g twice a day or as directed by the Physician.

Arjuna Capsule -1 capsule twice a day or as directed by the Physician.

Arjuna Tablet -1 tablet twice a day or as directed by the Physician.

HOW TO USE ARJUNA [21]

1. Arjuna Chaal Churna

a. Take 2-3 gm of Arjuna Chaal (bark) churna or as directed by the Physician

b. Add honey or water and take after lunch and dinner.

2. Arjuna Capsule

a. Take 1-2 Arjuna capsules or as directed by the Physician

b. Swallow it with water or milk after lunch and dinner.

3. Arjuna Tablet

a. Take 1 Arjuna tablet or as directed by the Physician

b. Swallow it with water or milk after lunch and dinner.

4. Arjuna Tea

a. Take 1-3 gm of Arjuna tea or as directed by the Physician

b. Boil in 1 cup water and 1 cup milk till the volume is reduced to 1/2 cup.

c. Drink once or twice a day in the morning and evening.

2. CARDAMOM (ELAICHI)

Scientific name: *Elettaria cardamomum*

Family: Zingibaraceae

Plant's Part Used: Fruit

Fig. 2: Various parts of *Elettaria cardamomum (Elaichi), including whole plant, raw fruits, dried fruits & its powder form.*

One of these spices that have many diverse antioxidant agents is cardamom. Cardamom belongs to the ginger family (Zingiberaceae) and its scientific name is Elettaria cardamomum [22]. The results of various studies have shown that cardamom flavonoids, which are mainly terpenoids, are responsible for the high antioxidant and medicinal benefits of the spice [23]. They also point out to the fact that flavonoids function in different mechanisms [24].

Yaghooblou Fatemeh *et al.* [25] reported that spice consumption helps the treatment of diseases due to their antioxidant and anti-inflammatory contents. Cardamom is one of these spices; therefore, this study was designed to determine the effect of cardamom supplementation on serum lipids, glycemic indices, and blood pressure in pre-diabetic women. Eighty overweight or obese pre-diabetic women were randomly allocated to two groups. The intervention group received 3 g of green cardamomand the placebo group received 3 g of rusk powder for 2 months. The physical activity level, dietary intake, anthropometric measurements, Blood pressure, fasting blood sugar (FBS), triglyceride (TG), total cholesterol (TC), low density lipoprotein (LDL-C), high density lipoprotein (HDL-C), insulin, body mass index (BMI), insulin resistance, and insulin sensitivity were measured before and after intervention. After intervention, mean TC ($p = 0.02$) and LDL-C ($p = 0.01$) significantly decreased and insulin sensitivity ($p = 0.03$) increased in the cardamom group. In the control group, mean HDL-C ($p = 0.02$) significantly decreased after the study. They observed no significant decrease in systolic and diastolic blood pressure, glycemic

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indices, and serum lipids values in the cardamom group compared to the placebo group. Green cardamom supplementation may have a protective effect on HDL-C level in pre-diabetic subjects. It improves some blood parameters in these subjects; however, its effects are not different from placebo.

S K Verma *et al. [26]* were worked on fruit powder of *Elettaria cardamomum* (L.) Maton. (Small cardamom) and they evaluated for its antihypertensive potential and its effect on some of the cardiovascular risk factors in individuals with stage 1 hypertension. Twenty, newly diagnosed individuals with primary hypertension of stage 1 were administered 3 g of cardamom powder in two divided doses for 12 weeks. Blood pressure was recorded initially and at 4 weeks interval for 3 months. Blood samples were also collected initially and at 4 weeks interval for estimation of lipid profile, fibrinogen and fibrinolysis. Total antioxidant status, however, was assessed initially and at the end of the study. Administration of 3 g cardamom powder significantly ($p<0.001$) decreased systolic, diastolic and mean blood pressure and significantly ($p<0.05$) increased fibrinolytic activity at the end of 12th week. Total antioxidant status was also significantly ($p<0.05$) increased by 90% at the end of 3 months. However, fibrinogen and lipid levels were not significantly altered. All study subjects experienced a feeling of well being without any side-effects. Thus, the present study demonstrates that small cardamom effectively reduces blood pressure, enhances fibrinolysis and improves antioxidant status, without significantly altering blood lipids and fibrinogen levels in stage 1 hypertensive individuals.

3. SARPGANDHA

Scientific name: *Rauwolfia serpentine*
Family: Apocyanaceae
Plant's part used: Roots

Fig. 3: Various parts of *Sarpgandha, including whole plant, raw roots, dried roots & its powder form.*

The root of the *Rauwolfia serpentina* has been in use in India for hundreds of years for a host of unrelated ailments. Since 1949, after the English publication of a clinical report by the author on *Rauwolfia serpentina* therapy in fifty cases of essential hypertension, the plant has gained universal acclamation as a useful therapeutic weapon in high blood pressure states. The whole subject of *Rauwolfia serpentina* therapy in hypertension has been reviewed up to the present time, including discussions on the history of the plant, its various species and types, nomenclature, geographic distribution, chemistry, pharmacologic actions and clinical studies, reported on the subject from all over the world. All parts of the plant, including the stem and leaves, contain indole alkaloids, but they are found in highest concentration in the bark of the root [27]. The identified indole and indole alkaloids include ajmalidine, ajmaline, ajmalinine, ajmalicine, aricine, canescine, coryanthine, deserpidine, isoajmaline, isoserine, isoserpiline, lankanescine, neoajmaline, papaverine, raubasine, raucaffricine, rauhimbine, rauwolfinine, recanescine, rescinnamine, reserpiline, reserpine, reserpinine, sarpagine, serpentine, serpentinine, thebaine, yohimbine, and yohimbinine [28, 29].

Wilkins RW & Judson WE, *[30]* studied *on Rauwolfia* product called Serpina was given to more than 100 patients for periods of 1 month to 1 year.25 In the study, a daily dose of 1 to 3 Serpina tablets was well tolerated. Its action was slow to appear, ranging from 3 to 6 days, and it disappeared 7 to 21 days after stopping the drug. It did not produce any serious side effects. The product caused sedation and usually improved sleep, although it could occasionally cause nightmares in some people, and it could cause bradycardia and nasal congestion in some patients. It apparently was not habit forming, and its administration could be stopped easily for several days to relieve any uncomplicated side effects. It promoted a moderate hypotension, particularly in labile patients with hypertension and tachycardia, and it appeared to have a sympatholytic effect but did not produce postural hypotension. It appeared to be more effective in young, neurotic hypertensive patients with tachycardia that in those with long-established, fixed hypertension with organic, vascular disease. Thirty-nine patients with an average blood pressure reading of 192/122 mm Hg and a pulse of 82 were treated with Serpina alone. The average blood pressure dropped to 165/95 mm Hg and the average pulse was 70. In 13 of 39 patients, blood pressure was controlled, returning to a normal reading of lower than 150/90 mm Hg.

In a clinical trial [31] of *R serpentina* in essential hypertension, Vakil treated 50 patients with initial blood pressures greater than 160/95 mm Hg. The study included 30 males and 20 females ranging in age from 39 to 76 years. Thirty-nine of 48 patients who completed the study showed a drop of both systolic and diastolic blood pressure at 1 week after starting the medicine. After 4 weeks of taking the medicine, systolic blood pressure dropped between 2 and 54 mm Hg for those patients. 22 of 47 patients (1 dropped out of the study) showed a moderate drop in systolic blood pressure, from 10 to 24 mm Hg. Thirteen of the 47 patients showed a marked drop in systolic blood pressure of greater than 25 mm Hg, and 38 of the 47 patients showed a drop in diastolic blood pressure of between 4 and 34 mm Hg, with an average drop of 11 mm Hg. Twenty-seven patients showed a

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moderate drop of diastolic blood pressure of between 5 and 14 mm Hg, and 7 patients showed a drop greater than 15 mm Hg. The hypotensive action of the drug was perceptible at 2 weeks after stopping the drug in 91% of patients and at 4 weeks after discontinuing the drug in 75% of patients. No serious adverse side effects were noted.

Douglas Lobay [32] reported that Rauwolfia appears to be a safe and effective treatment for hypertension when used in appropriate low doses. An equivalent dose of pure *Rauwolfia* alkaloids, also known as alseroxylon extract or pure reserpine, can also be used to treat hypertension. The author has found that LDR can be safely recommended to patients who have been screened to be of benefit from the treatment. The total daily dose of *Rauwolfia* should be lower than 500 mg of root and, in most cases, can be less than 250 mg per day. The dosage of purified alkaloidal seroxylon extract should be lower than 5 mg per day and, in most cases, is less than 2.5 mg per day. The reserpine dose should be lower than 500 µg per day and, in most cases, lower than 250 µg per day. An equivalent tincture dose should be based on the strength of the tincture. For instance, the dose of a 1:5 tincture would be 0.5 mL, equaling 100 mg of crude root, whereas in a standard dropper, 15 drops would equal 1.0 mL.

4. TURMERIC

Scientific name: *Curcuma longa*
Family: Zingiberaceae
Plant's Part Used: Rhizomes/ Roots

Fig. 4: Various parts of *Curcuma longa, including whole plant, raw roots, dried roots & its powder form.*

World Hypertension Day, learn all about the benefits of turmeric for high blood pressure:

1. Curcumin helps in lowering blood pressure

Turmeric is popular for its antioxidant curcumin which helps in lowering blood pressure. Its antioxidant properties are the responsible for regulating blood pressure in the body. Curcumin also protects against vascular dysfunction in the body [33].

2. Turmeric prevents arterial damage

Apart from regulating blood pressure, turmeric also helps in taking care of the damage caused by high blood pressure. As mentioned above, high blood pressure in the body can lead to various heart ailments. A common reason behind heart ailments is accumulation of plaque in arteries. Plaque narrows arteries and slows blood flow to heart, brain and various other body parts.

Having high blood pressure in this case, causes further damage to tissues in arteries. LDL (or bad) cholesterol begins to deposit in arteries in the form of plaque in the walls of arteries. Curcumin in turmeric can help in preventing further damage caused to arteries because of high blood pressure [33].

Curcuma longa (CL) or turmeric is one of the alternative herbs which confer medicinal properties. This review aims to summaries the effects of CL and its active constituents on blood pressure derived from preclinical and clinical published articles. Studies documented that CL and its active constituents could reduce blood pressure. These were achieved by antioxidant, anti-inflammatory activity, calcium ion concentration interference, â2-adrenergic receptor activation, and renin-angiotensin system inhibition. There is a potential role of CL in the management of hypertension. However, limited studies of CL have been conducted on human. Thus, more well-planned studies should be carried out to ascertain its effectiveness [34].

Curcuma longa (CL), or commonly known as turmeric, originates from southeast India and is extensively cultivated in tropical areas of South Asia. It is a herbaceous perennial plant in the ginger family, known as

Zingiberaceae. Its aromatic tuberous rhizome has been widely used in medicinal, culinary and dyeing purposes [35]. Hypotensive and vasorelaxant activities of the methanolic extract of CL (MECL) were studied in male Wistar normotensive rats [36].

Choi *et al.* (2018) analyzed data from the Korean National Health and Nutrition Examination Survey (KNHANES) 2013 to investigate the effect of curry consumption in reducing hypertension. This cross-sectional study involving 1350 relatively healthy subjects were divided into curry intake group (n = 603) which had consumed a curry dish more than once a month over the previous year, and non-curry intake group (n = 747). The most common curry powder available in the market of South Korea is 10% of total 20 g portion per person. This amount equivalent to about 2 g of CL with 1 mg to 11.5 mg of curcumin present in the curry powder [37]. For high levels of cholesterol or other fats (lipids) in the blood (hyperlipidemia): 1.4 grams of turmeric extract in two divided doses daily for 3 months has been used [38].

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5. GARLIC

Scientific name: *Allium sativa*
Family: Alliaceae or Liliaceae
Plant's Part Used: Dried Cloves

Fig. 5: Various parts of *garlic, including whole plant, head (bulb) and clove of garlic & its powder form.*

Garlic (*Allium sativum*) has been used as a spice, food, and medicine for over 5,000 years, and is one of the earliest documented herbs utilized for the maintenance of health and treatment of disease. [39]. In some of the oldest texts on medicine, eg, the Egyptian Ebers papyrus dating around 1500 BC and the sacred books of India, "the Vedas" (1200–200 BCE), garlic was recommended for many medicinal applications, including circulatory disorders [40]. In ancient Greece, garlic was used as a diuretic, as recorded by Hippocrates, the father of modern medicine [41].

The bulb of garlic is commonly used for a variety of ailments. Garlic is used for hypertension, hyperlipidemia, coronary heart disease, age-related vascular changes and atherosclerosis, earaches, chronic fatigue syndrome (CFS), and menstrual disorders. Garlic is regarded as a potent platelet aggregation inhibitor. Many of the pharmacological effects of garlic are attributed to the allicin, ajoene, and other organo-sulfur constituents such as S- allyl-L-cysteine. Fresh garlic contains approximately 1% alliin [42]. One milligram of alliin is converted to 0.458 mg allicin which is regarded as the major active compound in garlic. Further conversion yields ajoene. The amount of allicin in garlic preparations is dependent upon the method of preparation. Taking low doses of garlic powder orally, 300 mg per day seems to slow the age-related aortic elasticity decrease. Higher doses of 900 mg per day seem to slow development of atherosclerosis in both aortic and femoral arteries when used over a four-year period [43]. Evidence suggests that taking garlic orally can modestly reduce blood pressure by 2% to 7% after 4 weeks of treatment [44]. (1) reducing total and LDL-cholesterol, (2) increasing HDL-cholesterol, (3) lowering triglycerides and fibrinogen, (4) lowering blood pressure, (5) improved circulation, (6) enhancing fibrinolysis, (7) inhibition of platelet aggregation, and (8) reducing plasma viscosity. The blood pressure effect is thought to be due to an opening of (Ca) ion channels in the membrane of vascular smooth muscle, affecting hyperpolarization, resulting in vasodilation [45-48].

Garlic supplements have shown promise in the treatment of uncontrolled hypertension, lowering blood pressure (BP) by about 10 mmHg systolic and 8 mmHg diastolic, similar to standard BP medication. Aged garlic extract, which contains *S*-allylcysteine as the bioactive sulfur compound, in particular is standardizable and highly tolerable, with little or no known harmful interaction when taken with other BP-reducing or blood-thinning medication. Here we describe biologically plausible mechanisms of garlic's BP-lowering effect. Garlic-derived polysulfides stimulate the production of the vascular gasotransmitter hydrogen sulfide (H_2S) and enhance the regulation of endothelial nitric oxide (NO), which induces smooth muscle cell relaxation, vasodilation, and BP reduction. Several dietary and genetic factors influence the efficiency of the H_2S and NO signaling pathways and may contribute to the development of hypertension. Sulfur deficiency might play a part in the etiology of hypertension, and could be alleviated with supplementation of organosulfur compounds derived from garlic [49].

6. CLOVE

Scientific name: *Syzygium aromaticum*
Family: *Myrtaceae*
Plant's Part Used: Flower buds.

Fig. 6: Various parts of clove*, including whole plant, flowers and dried flowers of clove & its powder form.*

Plants high in eugenol, a phenylpropanoid compound, are used as folk medicines to alleviate diseases including hypertension. Eugenol has been demonstrated to relax conduit and ear arteries and reduce systemic blood pressure, but mechanisms involved are unclear. Here, we studied eugenol regulation of resistance-size cerebral arteries that control regional brain blood pressure and flow and investigated mechanisms involved. It was demonstrated that eugenol dilates arteries constricted by either pressure or membrane depolarization (60 mM K+)

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in a concentration-dependent manner. Experiments performed using patch-clamp electrophysiology demonstrated that eugenol inhibited voltage-dependent calcium (Ca^{2+}) currents, when using Ba^{2+} as a charge carrier, in isolated cerebral artery smooth muscle cells. Eugenol inhibition of voltage-dependent Ca^{2+} currents involved pore block, a hyperpolarizing shift (~−10 mV) in voltage-dependent inactivation, an increase in the proportion of steady-state inactivating current, and acceleration of inactivation rate. In summary, our data indicate that eugenol dilates cerebral arteries via multi-modal inhibition of voltage-dependent Ca^{2+} channels [50].

7. GINGER

Scientific name: *Zingiber officinale*
Family: *Zingiberaceae*
Plant's Part Used: Rhizomes/ Roots

Fig. 7: Various parts of ginger, *including whole plant, rhizome and dried roots & its powder form.*

Ginger (*Zingiber officinale* Roscoe) rhizome is one of the hot spices belonging to Zingiberaceae family; a herbaceous perennial plant native to Southern Asia. Ginger rhizome is extensively consumed as a spice in foods and beverages because of its characteristic pungency and piquant flavor. Ginger contains many cations and anions, as calcium, magnesium and phosphorus that it has a function in bone development, muscle contraction and nerve conduction. These minerals in ginger are useful for muscle contraction, hypertension, muscle weakness, seizures. It also contains great amount of potassium which has a role in regulation of blood pressure & heartbeat [51]. In addition to study by Ojulari, et al; in 2014 [52], who investigate the effect of ginger on the cardiovascular system (CVS), their result showed that significant reduction of systole and diastole blood pressure. Chemical proprieties in ginger may help lower overall blood cholesterol, as well as low density lipoproteins, which are components of cholesterol that can contribute to heart disease, by atherosclerosis & plague. This creates obstacles that can contribute to high blood pressure by restricting the inner diameter of arteries and may also reduces the elasticity of arteries, further contributing to high blood pressure [53, 54].

Mohamed Ibrahim Shaban *et al.* [55] reported that hypertension is a major factor for coronary artery disease and lead to death. Ginger is an ancient herbal used for treatment of variety of diseases. It has a diuretic and blood pressure lowering effect so recommended by Food and Drug Administration (FDA) as a food additive that is "generally recognized as safe." Research design; Quasi experimental design was used to achieve the aim of the study. Setting: The study was conducted at medicine outpatient's clinic at Menoufia University Hospital. A convenience sample of 120 adult who visited outpatient clinic was undertaken. They were divided alternatively into three equal groups 40 patients in each group (two studies which divided into group taking ginger only, group taking ginger with the prescribed medication and control group). Two tools used; tool 1 divided into: -Part one: to assess socio demographic data; Part two: (A) Medical history and symptoms. (B) Current symptoms of hypertension; and Part three: patients Knowledge about their disease; Tool two: physiological Measurement of blood pressure. There was statistically significant difference among both studied groups and control group regarding to systolic and diastolic blood pressure during post one week and month of intervention. There was a high statistically significant difference for blood pressure clinical manifestations between both study groups and control, after taking ginger for one month; good prognosis occurred for both study groups; while control group had the signs and symptoms in pre-post. Conclusion: Based on the previous researches and the current study results, the researchers supported ginger in treatment of hypertension with antihypertensive drug. Integrate program about herbal therapy support conservative medication for chronic diseases as cardiovascular diseases. Apply research on large number of patient with more times for follow up.

Zingiber Officinale, commonly known as ginger, has been widely used traditionally in the daily diet and a variety of medicinal purposes. There are some animal studies on the hypotensive mechanism of ginger. The aim of this systematic review was to extract the evidence from all human participant randomized and quasi-randomized controlled trials that have assessed the effects of ginger on the blood pressure (BP) of any population. According to animal studies ginger has the potential to offer a natural alternative dietary supplementation to conventional anti-hypertensive agents, but still there is not enough evidence supporting this claim and current limited evidence is controversial. More human trials studying the effect of ginger on hypertensive patients using different dosage of a standardized extract are needed [56].

Hossein Hasani *et al.* was determined the efficacy of ginger supplementation on blood pressure (BP). PubMed, Scopus, ISI Web of Science, Cochrane Library, and Google Scholar were comprehensively searched until September 2018. Human clinical trials, which reported the effect of ginger supplementation on aortic and/or brachial BP, were included. Mean differences were pooled using a random effects model. Standard methods were used for assessment of heterogeneity, sensitivity analysis, and publication bias. Total of six randomized clinical trials (345 participants) were included in the meta-analysis. Pooled analysis suggested that ginger supplementation can reduced systolic BP (MD: -6.36 mmHg, 95% confidence interval [-11.27, -1.46]; I^2 = 89.8%; P = 0.011) and diastolic BP (MD: -2.12 mmHg, 95% confidence interval [-3.92, -0.31]; I^2 = 73.4%; P = 0.002). When studies were categorized based

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on participants' mean age, ginger dosage and duration of intervention, systolic BP and diastolic BP were significantly decreased only in the subset of studies with mean age ≤ 50 years, follow-up duration of ≤8 weeks and ginger doses ≥3 g/d. Our findings revealed that ginger supplementation has favorable effects on BP. Nonetheless, further studies are warranted before definitive conclusions may be reached [57].

8. HONEY

Scientific name: *Apis mellifera*
Family: *Apidae*
Type used: Natural bee's honey

Fig. 8: Honey

Honey is a natural sweetener, contains mainly monosaccharaides (up to 80%), disaccharides (3–5%), water (17–20%) and a wide range of minor constituents such as vitamins, minerals, proteins, amino acids, enzymes and phytochemicals [58, 59]. Its composition varies depending on botanical and geographical origin, as well as environmental conditions. The sugar components determine the energy value and its physicochemical properties which are critical for technological functions of honey [59-61]. Phytochemicals, mainly phenolic acids and flavonoids, are present in smaller quantities but they strongly determine the unique flavour, appearance and bioactivities of honey [59]. Phenolic compounds are known to offer complementary and overlapping modes of action through antioxidant activity, antibacterial and antiviral activities, modulating detoxification enzymes, stimulating the immune system, reducing platelet aggregation, modulating cholesterol synthesis and reducing blood pressure among the others [62-63]. Thus, their presence in the composition attributes to the relevant health benefits of honey [64]. Numerous studies have examined the phenolic profiles in honey and reported a high correlation of phenolic content with antioxidant capacity of honey [65, 66].

Esther Olusola Aluko *et al.* [67] reported that food is the energy source of the body; honey is not only a natural sweetener that provides the body with energy, but has been used as a medicine for different diseases in different parts of the world. This study evaluated honey's ability to reduce systolic blood pressure, diastolic blood pressure and heart rate in healthy male subjects. We assessed the systolic blood pressure (SBP), diastolic blood pressure (DBP) and heart rate (HR) of fifty healthy male subjects, their basal SBP, DBP and HR were taken and was use as the control value. Each subject was give 20 ml of honey to consume and their SBP, DBP and HR were measured at different intervals; 15 minutes, 30 minutes and 60 minutes after the intake of honey. The blood pressure was measured, using sphygmomanometer/auscultatory method and heart rate was determined via palpating the radial pulse. Honey significantly (p= 0.05) decreased SBP from 117.80 ± 0.88 mmHg to 110.20 ± 2.14 mmHg after 15 minutes of honey intake. The significant (p= 0.05) decrease was maintained after 30 minutes of honey consumption at 111.33 ± 2.14 mmHg, and it was also observed after 60 minutes of honey intake at 110.4 ± 2.08 mmHg. The result shows that short-term honey consumption has the ability to reduce blood pressure in healthy male subjects and its consumption might have a beneficial effect.

Cholesterol is the factor responsible for atherosclerosis (narrowness of blood vessels) thus food rich in saturated fats and Trans fats are detrimental to the heart [68]. High carbohydrate diet has also been documented to be detrimental to the cardiovascular system [69]. Honey, though constituted by mainly sugar has been reported to be cardioprotective; Maureen 2004 [70] recommended that eating honey can reduce blood levels of some macromolecules that are linked to an increased risk of heart disease, a study reported that systolic and diastolic blood pressure were reduced by honey inhalation in hypertensive patients [71].

Honey, a natural sweetener has been used universally as a complete food and in complementary medicine since early antiquity. Honey contains over 180 substances, including sugars mainly fructose and glucose, water and a plethora of minor constituents such as vitamins, minerals and phytochemicals. The chemical composition of honey varies depending on floral origin, environment and geographical conditions. The sugar components dominate honey composition and they are accountable for sensory and physicochemical properties in food industry. Although present in small quantities, non-sugar components are the major contributors to the health benefits of honey. Our review summarizes and discusses composition of honey, its protective effects and possible action modes on risk factors of atherosclerosis [72].

METHODS:

Six ingredients like Arjuna barks, Sarpgandha roots, Turmeric Roots, Garlic, Cloves and Ginger were taken and they were dried in oven under controlled temperature. After drying all the ingredients, separately powder was prepared by grinding and dried properly. All the powdered materials were passed through the sieve no. 22. Now, dried herbal powder was mixed with specified quantity and then it was mixed up properly to get powder mixtures, which is shown in figure 9.

One gram of each powder is to be taken and dissolved in a glass of warm water. After adding all the ingredients, 5ml of honey is added so that the bitter taste is reduced and 1 gm of Elaichi powder was added separately for the fragrance, flavor and taste. In this way, a natural anti-hypertensive herbal tea is prepared for controlling the hypertension or high blood pressure. One gram of each powder of four gram was packed in packet tea bags (Figure 10). These tea bags are used for making the anti-hypertensive tea which controlled and maintained the Hypertension of patients.

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RESULTS AND DISCUSSION

Fig. 9: Mixtures of powder of all the herbal ingredients

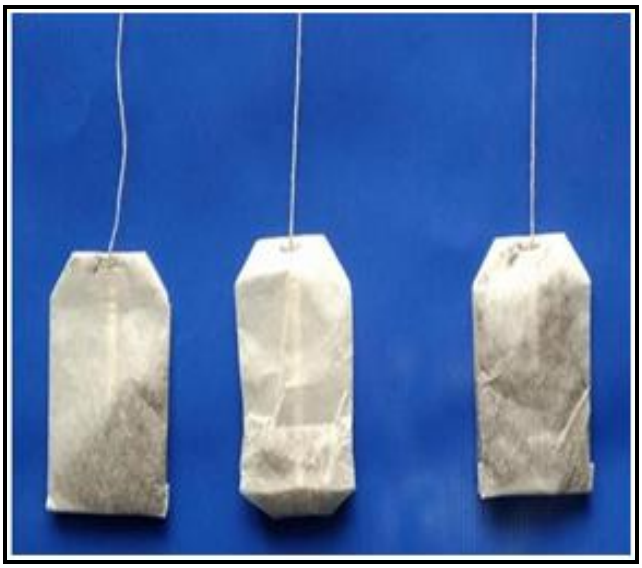

Fig. 10: Fabricate tea bag with mixtures of herbal ingredients

The results were remarkable and significant. Curcumin exerts beneficial effects on cardiovascular diseases, including hypertension. *Rauwolfia also used in* the treatment of high blood pressure. *Rauwolfia* appears to be a safe and effective treatment for hypertension when used in appropriate low doses. An equivalent dose of pure *Rauwolfia* alkaloids, also known as pure reserpine, can also be used to treat hypertension. These ingredients have the potential to lower BP in hypertensive individuals similarly to standard BP medication, via biologically plausible mechanisms of action.

CONCLUSION

Lifestyle changes, including diet, exercise, and stress management, may contribute significantly to lowering of blood pressure. Supplements such as potassium, magnesium, CoQ10, omega- 3 fatty acids, amino acids Aarginine and taurine, and vitamins C and E have been effectively used in the treatment of cardiovascular disease, including hypertension. They have proven effective in lowering blood pressure and improving heart functions. Among the most researched and frequently utilized for hypertension are Hawthorne, *Arjuna*, Olive leaf, European mistletoe, Yarrow, Black cumin seeds, Forskolin, Indian snakeroot, and Garlic. Often referred to as the 'silent killer', high blood pressure or hypertension is a serious clinical condition that elevates the risk of heart and brain diseases. To define blood pressure, it is the force exerted with the circulating blood on the various arteries in the body. When this blood pressure is too high, it is called Hypertension.

A very famous saying states that "Prevention is better than cure". The anti- hypertensive herbal tea is a natural therapy that can be used in daily life in order to achieve normal blood pressure, fit and a healthy body. And from this article, it can be concluded that scientific evidence of the anti-hypertensive herbal tea shows better health and medical effects of anti- hypertensive herbal tea. Drinking of anti- hypertensive herbal tea instead of regular tea very helpful for the ability to help reduce high blood pressure and combat hypertension and keeps the heart healthy and fit and a good start of day with numerous other health benefits. Goodness of Honey and widely acceptable flavor of cardamom which are also medicinally for treating hypertension plays a very significant role in providing taste, flavor and fragrance makes it a pre-eminent anti-hypertensive herbal tea. There is no specific underlying cause for high blood pressure, as it is a lifestyle-related disease. There are a couple of triggers that increase the risk of getting hypertension or elevated blood pressure, some of which are unhealthy diet, age, smoking, alcohol consumption, physical inactivity, obesity, heredity, diabetes and many more. Many allopathic drugs are used for treatment of hypertension But these drugs have some side effect like muscle cramps, dizziness, extreme tiredness, dehydration, blurred vision, abnormal heart rate, skin rash *etc*. Herbal remedies are still widely used in world for the treatment of hypertension because herbal medicines are harmless as compared to allopathic medicines. The various medicinal plants which are used for the treatment of hypertension are discussed in the paper.

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