

Evolvulus alsinoides: A potential antihypertensive herb

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ABSTRACT

In spite of the fact that a variety of unfailing guidelines are existing for the management of hypertension, the problem of inadequate managing of this condition still continues. Several classes of existing antihypertensive drugs are associated with various side-effects. Since ancient times before the advent of anti-hypertensive drugs, this disease has been treated by the prominent classical scholars.

Various herbal drugs are being used since ages for the treatment of hypertension and some of them are validated too. *Evolvulus alsinoides* is also one such herb used in classical literature since ages for various disorders like insanity, anxiety, nervous debility, epilepsy, melancholy, palpitation and many others. This review is to highlight the antihypertensive potential of *Evolvulus alsinoides*.

Keywords: Anti-hypertensive, herbal drugs, classical literature, *Evolvulus alsinoides*.

INTRODUCTION

Hypertension or High blood pressure is well-thought-out to be major public health issue as it contributes to one of the leading causes of human death and disability worldwide (PM Kearney, 2005). Hypertension (HTN) is a chronic medical condition in which there is long term elevation of blood pressure in arteries. Persistent elevation of the blood pressure in the arteries increases the risk of acute cardiovascular events, heart disease and stroke. Hypertension can also lead to other conditions such as congestive heart failure, kidney disease, arterial aneurysm and blindness. (SD Pierdomenico, 2009). As per JNC 7 and 8 criteria, normal blood pressure is in the range of systolic blood pressure of ≤ 120 mm Hg and diastolic of ≤ 80 mm Hg. The systolic blood pressure between 120 – 139 mm Hg and diastolic of 80-89 mm Hg is said to be the stage of Pre-hypertension. If it rises between 140–159 mm Hg of systolic and 90-99 mm Hg diastolic, it is considered as Stage I hypertension, whereas, above 160 mm Hg of systolic and >100 mm Hg diastolic, it is graded as Stage II hypertension (AV Chobanian, 2003).

Globally cardiovascular diseases account for approximately 17 million deaths a year (Anonymus, 2008). Of which complications of hypertension account for 9.4 million deaths worldwide every year (Lim, 2102). Hypertension is responsible for at least 45% of deaths due to heart disease (Ischemic heart disease), and 51% of deaths due to stroke.

As per World Health Organization report, about 40% of people aged more than 25 years had hypertension in 2008 (Anonymus, 2103). Worldwide, 7.6 million premature deaths (about 13.5% of the global total) were attributed to high blood pressure.

According to the WHO 2008 estimates, the prevalence of raised BP in Indians was 32.5% (33.2% in men and 31.7% in women) (Anonymus, 2103). In an analysis of worldwide data for the global burden of hypertension, 20.6% of Indian men and 20.9% of Indian women were suffering from hypertension in 2005. The rate for hypertension in percentage are projected to go up to 22.9 and 23.6 for Indian men and women, respectively by the year 2025 (PM Kearney, 2005). Recent studies from India have shown the prevalence of hypertension to be 25% in urban and 10% in rural people in India.

In conventional medicine certain classes of antihypertensive drugs like diuretics, calcium channel blockers, ACE inhibitors and beta blockers etc. are in vogue. But some adverse effects are associated with their use. Likewise amongst commonly used anti-hypertensive drugs first-line low-dose thiazides are utmost effective to reduce hypertension and mortality and morbidity (stroke, heart attack and heart failure), stated by Wright. And he also ascertained that these first-line low-dose thiazides are the best choice for elevated blood pressure when compared with angiotensin II receptor blockers (ARBs), calcium channel blockers, beta-blockers, (ACE) inhibitors, and alpha-blockers. (J M Wright, 2009). Besides having anti-hypertensive effects some side effects are also present with increased risk of developing diabetes by disturbing the glucose balance of body (Zillich, 2006). The antihypertensive like apresoline is very effective but its daily usage of more than 300 mg per day results in adverse effects like headache, tachycardia and palpitation etc (Edward, 1954). Furthermore, some of these medicines are much costly.

Out of several medicinal herbs (*Allium sativum*, *Linum usitatissimum*, *Rauwolfia serpentina*, *Zingiber officinale*) with the antihypertensive and cardioprotective activity mentioned in classical text, *Evolvulus alsinoides* is also well-known for the antihypertensive, anti-oxidant, anti-inflammatory activity. *Evolvulus alsinoides* (L) of family convulvaceae, is a perennial herb, small, hairy, procumbent, with a small woody and branched rootstock (Austin, 2008). Traditionally, this plant is being used for the treatment of fever, cough, cold, venereal

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diseases, bronchitis, biliousness, epilepsy, leucoderma, azoospermia, adenitis, dementia and used to promote hair growth, improves the complexion and appetite and many more (Kiritikar KR, 1994) (LV Asolkar, 1992) .

This review is to highlight the antihypertensive potential of the popular medicinal herb *Evolvulus alsinoides*.

Types and pathophysiology of hypertension

Basically there are two types of hypertension essential and secondary, essential hypertension (also known as primary hypertension or idiopathic hypertension) by definition has no identifiable cause. It is the most common type of hypertension, affecting about 95% of hypertensive patients. (Ahmad, 2001)

There are many factors such as sedentary life, visceral obesity, stress, potassium deficiency, alcohol intake, and vitamin D deficiency which increases the risk of hypertension. Risk of disease also increases with aging, a family history of hypertension and some inherited genetic mutations. Furthermore, an elevation of renin, an enzyme secreted by the kidney, the over activity of sympathetic nervous system. Consuming foods that contain high fructose corn syrup may increase one's risk of developing hypertension. (IS Hwang, et al., 1987)

Secondary hypertension by definition is a result of an identifiable cause. This type is significant to be distinguished as it is treated in different manner than essential hypertension, by treating the underlying cause of the raised BP. Secondary hypertension results from compromise or disproportion of the pathophysiological mechanisms, such as the hormone-regulating endocrine system, which regulate blood plasma volume and functions of heart. Several conditions are responsible for producing hypertension. Some of them are common and well-recognized secondary causes such as Cushing's syndrome, which is a condition where there is overproduction of cortisol hormone by adrenal glands (C Dodt, 2009). Moreover, hypertension is also caused by other conditions that cause hormonal changes such as hyperthyroidism, hypothyroidism, and adrenal gland hyperplasia or carcinoma. Other common causes of secondary hypertension include kidney disease, obesity/metabolic disorder, pre-eclampsia during pregnancy, coarctation of the aorta (the congenital anomaly), and certain drugs.

As far as pathophysiology is concerned the mechanisms associated with secondary hypertension are generally completely well-known and understood. But, those associated with essential (primary) hypertension are far less understood. The fact identified is that cardiac output is raised initially in the disease sequence, with normal total peripheral resistance (TPR). Then over the time, cardiac output drips to normal levels, but TPR is increased. The following theories have been projected to explain the mechanism behind:

- Incapability of the kidneys to excrete sodium, that results in natriuretic factors such as atrial natriuretic factor being secreted to promote salt excretion with the side effect of elevation of TPR.
- An over-activity of renin-angiotensin system (RAAS) leads to vasoconstriction and retention of sodium and water. The increase in blood volume leads to hypertension (E Pimenta, 2009).
- An over activity of sympathetic nervous system, leading to increase in stress responses (Takahashi, 2008).
- It is also accredited that hypertension is highly heritable and polygenic (caused by more than one gene) and a few candidate genes have been assumed in the etiology of this condition (GA Sagnella, 2006).

- Association of pro-inflammatory markers like CRP, TNF- α , IL-6 and serum amyloid A etc. is well known in essential hypertension. Animal experiments suggest that cytokines, such as CRP, Serum Amyloid A, and TNF- α , are related to the occurrence of hypertension. Studies are also suggestive that elevated CRP levels promote the development of hypertension (HD Sesso, 2003).
- Endothelial dysfunction and oxidative stress is also been reported to cause hypertension (Agarwal D, 2009).

Recently, a lot of work related to association between essential hypertension and sustained endothelial damage is major concern among scientists. The exact pathophysiology is uncertain that whether endothelial changes precedes the development of hypertension or whether such changes are mainly due to long-standing elevated blood pressure.

Anti-hypertensive potential of *Evolvulus alsinoides*

As far as the classical Unani literature is concerned numerous single drugs, as well as formulations, have been mentioned for the management of hypertension with proven efficacy. *Evolvulus alsinoides* Linn. has been used by the prominent scholars of Unani system of medicine in various cardiovascular diseases as cardiac tonic and there symptoms like palpitation. Besides cardiovascular illnesses, the drug has also been used for its certain therapeutic actions like a diuretic, brain tonic, nervine tonic and as tranquilizer (Najmul, YNM).

In classical literature, whole plant of *Evolvulus alsinoides* is reported for its beneficial effects in hypertension (Anonymous) (Singh Amritpal, 2008). These drugs also act as Ayurvedic rasayana because these contain many of therapeutic phytochemical constituents (i.e. glycosides, alkaloids, flavanoids, tannin, resins etc.) with no adverse effects. Whole herb of *Evolvulus alsinoides* also possesses braintonic (memory stimulant), immunomodulatory, antioxidant activity, diuretic, gastro protective, antibacterial, anthelmintic, adaptogenic (antistress) and anti-amnesic activities without any side effects (Singh Amritpal, 2008).

Furthermore, the contemporary evidences in support of literature are as follows:

- Ethanolic extract of the entire herb was evaluated by in vitro methods for free radical scavenging activity and findings specified promising antioxidant activity of the crude extract of *E. alsinoides*. (Gomathi D, 2014)
- Methanolic extract of *Evolvulus alsinoides* were effective antimicrobials against for all the microbes studied, in the meantime the plant extracts were rich in flavonoid and alkaloid, certainly holding potent antioxidant activities (Moghadam NS, 2017) .The antioxidant activity of this plant may be due to the presence of antioxidant phytochemicals like poly phenolics, steroids and triterpenes. (Gomathi D, 2014)
- A number of successive extractions (viz. petroleum ether, chloroform, ethyl acetate, ethanol, hydro-alcoholic) of *Evolvulus alsinoides* were studied and study established the antioxidant potentials of the herb. (Mukesh Kumar Yadav, 2018)
- Crude extracts of *Emblica officinalis* and *Evolvulus alsinoides* were directed intra-peritoneal followed by a repeated treatment profile. The induction of nitric oxide synthase (NOS) was seen to be considerably

reduced in treated animals as compared to controls. The observations advocated that both the herbal extracts caused immunosuppression in AIA rats. (Lilly Ganju, 2003)

- The study reports definite the isolation and structure revelation of the new flavonol, glycosides, evolvosides C-E (1-3) and their anti-stress activity. The compounds have revealed significant ($p < 0.01$) anti-stress activity by normalizing hyperglycemia, corticosterone level, creatine kinase and adrenal hypertrophy. (Prasoon Gupta, 2013)
- Profound antihypertensive activity of *Evolvulus alsinoides* herb was exhibited by Methanolic extract in adrenaline induced hypertensive model. (Umang H. Joshi, 2012)
- The antihypertensive effect of methanolic extract of whole herb was apparent in DOCA salt induced hypertensive mice and the study also revealed that its activity was due to ACE inhibitor mechanism of *Evolvulus alsinoides* herb extract as the extract lowered the blood pressure as similar to enalapril without interfering with pulse rate. (Umang H. Joshi, 2012)
- Clinical study performed by Qamar Alam on 60 patients concluded that test drug Sankhaholi (*Evolvulus alsinoides* Linn.) has substantial efficacy as an antihypertensive drug in patients of essential hypertension. (Qamar Alam Khan, 2018)

The above mentioned pharmacological studies (pre-clinical and clinical) like antioxidant, anti-stress, effect on cortisol level, antihypertensive especially the ACE inhibitor activity supports the antihypertensive potential of the drug.

CONCLUSION

Owing to several side effects of the conventional medicine the population is gradually leaning towards the traditional system of medicine for the management certain disorders. The reports from studies mentioned exhibits the efficacy of *Evolvulus alsinoides* in managing hypertension. The anti-stress, antioxidant and the antihypertensive activity of the herb indicates the potential in hypertension and also ropes the traditional use of this medicinal plant. Further clinical studies on large scale are needed to validate the efficacy of the drug in managing hypertension

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CONFLICT OF INTEREST

The authors have no conflicting financial interests.

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