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## Literary review article on efficacy of Guduchi in diabetic peripheral neuropathy

**Dr. Sadhana Prithviraj Chavan, Dr. BB Kadlaskar, Dr. Anuja Gholap and Dr. Hardik Modi**

### Abstract

Diabetic peripheral neuropathy is a nerve damaging disorder associated with diabetes mellitus. Diabetic microvascular injuries involving small blood vessels that supplies to nerves i.e. vasa nervorum are responsible for diabetic peripheral neuropathy. In Ayurveda, madhumeha vyadhi has similarity with diabetes mellitus. Madhumeha is one of the four varieties of Vataja Prameha. In itsasadhya (incurable) stage, madhumeha gives rise to any upadrava (complication). Daha (burning sensation), suptata (numbness), harsha (tingling sensation), shosha (wasting), dourbalya (weakness), angasadaare the symptoms of upadrava (complication) of madhumeha, which are nearly similar to the symptoms of diabetic peripheral neuropathy. The regimens used in modern medicine for diabetic peripheral neuropathy are effective, but they are expensive and having side effects. On the other hands, Ayurveda has some Herbal remedy may be used as an alternative therapy in this condition. Guduchi (*Tinospora cordifolia*) is one of the most important Ayurvedic medicine. It is recommended for Diabetic neuropathy because of its anti-Diabetic, analgesic, antioxidant and immunomodulatory activities. The effect of Guduchi (*Tinospora cordifolia*) on Diabetic Peripheral Neuropathy is scientifically validated in various animal models.

**Keywords:** Diabetic peripheral neuropathy, Madhumeha, Upadrava, Guduchi (*Tinospora cordifolia*)

### Introduction

Diabetic peripheral neuropathy is one of the most important complication of diabetes mellitus. It is a nerve damaging disorder which is a result of diabetic microvascular injury involving small blood vessels that supplies to nerves i.e. vasa nervorum. Diabetic peripheral neuropathy is a common condition, often unreported and inadequately treated resulting in a great deal of morbidity<sup>[1, 2]</sup>.

Prevalence of diabetic peripheral neuropathy in India is about 26.1%<sup>[3]</sup>. Peripheral diabetic neuropathy is pathologically characterised by peripheral demyelination, decrease in the nerve conduction and degeneration of myelinated and demyelinated sensory nerve fibres. It is presented with the symptoms such as tingling or burning sensation and numbness, sharp pains or cramps, insensitivity to pain, motor incoordination, loss of sense of vibration, change in temperature etc. If it is not treated, it may lead to loss of reflexes and deformities that may progress to gangrene<sup>[4]</sup>.

### Consideration of Diabetic Peripheral Neuropathy as per Ayurveda

Diabetic peripheral neuropathy is a complication of diabetes mellitus. Complications are known as *Upadrava* in Ayurveda. *Upadrava* are those which appear after the onset of *pradhana vyadhi* (main disease). *Nidana* (etiology), *dosha*, *dushya* of *Updrava* are same as that of main disease<sup>[5]</sup>. The *Upadrava* (complication) will have its own *samprapti* (pathology). When main disease is cured, complication will disappear<sup>[6]</sup>.

In ayurveda diabetes mellitus can be correlate with *Madhumeha*, in which the urine becomes excessive in quantity, sweet in taste and smells like honey. Amongst the twenty types of *Prameha*, *Madhumeha* is one of the four varieties of *Vataja prameha*. According to *Acharya Charak*, *Madhumeha* attains *asadhya* (incurable) stage, if there is a strong bonding between morbid *doshas* and *dushyas*, it may give rise to any *Upadrava* (complication)<sup>[7]</sup>.

The symptoms of *Upadrava* (complication) of *Madhumeha* are *daha* (burning sensation), *suptata* (numbness), *harsha* (tingling sensation), *shosha* (wasting), *Dourbalya* (weakness), *angasada*. All the above symptoms are nearly similar to the symptoms of diabetic peripheral neuropathy [8]. The functions of peripheral nerves are damaged in diabetic peripheral neuropathy. In Ayurveda; *Vatadosha* especially *Vyanavayu* performs the functions of peripheral nerves. The functions of normal *Vatadosha* are *utsahashakti* (enthusiasm), *shwasaprashwasakriya* (respiration), *chesta* (motor and reflex activities) etc; hence it act as receptor, as well as a stimulator [9]. The function of a peripheral nerve is to transmit signals from the spinal cord to the rest of the body or to transmit sensory information from the rest of the body to the spinal cord. Nerve impulse can be correlate with functions of normal *Vatadosha* as it is self-originated, propagated, it reaches anywhere. Hence, the disease diabetic peripheral neuropathy is considered based on abnormal functions of *Vatadosha*.

Painful diabetic peripheral neuropathy is treated with tricyclic antidepressants, SNRIs, anticonvulsants, opioids and topical capsaicin, of which duloxetine and pregabalin have been approved by the US FDA [10]. These regimens are effective but most of them are expensive and having side effect. On the other hands, Ayurveda has some herbal remedy may be used as an alternative therapy in this condition. Ayurvedic drugs are natural drug material, they are more promising & not found to produce any side effects and resistance. Guduchi (*Tinospora cordifolia*) is one of the most important Ayurvedic medicine recommended for diabetes. Guduchi (*Tinospora cordifolia*) can be helpful to enhance result of modern drugs by lowering their side effect and increasing efficacy and safety.

### Materials and methods

Guduchi (*Tinospora cordifolia*) is an important and widely used herb in ayurvedic medicine. It belongs to the family Menispermaceae. In Ayurveda it is mentioned in *Patra Shaka Varga* with the name *Vatsadani* which is the synonym of Guduchi . It indicates the use of Guduchi leaves as vegetable [11, 12] It is considered as "*Rasayana*" because it helps to improve immune system and resistance of the body against infections [13].

**Gana:** [14] It is included in 8 different *ganasi*. e. *Sandhaniya*, *Triptighna*, *Stanyashodhana*, *Snehopaga*, *Trishnanigrahana*, *Dahaprashamana*, *Prajasthapana*, *Vayahsthapana* by *Acharya Charak*.

### Ayurvedic Properties

**Rasa:** Tikta, Katu  
**Guna:** Guru, Snigdha  
**Veerya:** Ushna  
**Vipaka:** Madhura  
**Prabhava:** Tridoshahara  
**Parts used:** Stem, Root, Leaves

Guduchi (*Tinospora Cordifolia*) shows Anti-Diabetic, analgesic, antioxidant and immunomodulatory activities which are scientifically validated in various animal models. These activities are helpful in reducing diabetic peripheral neuropathy [15].

### Anti-Diabetic Activity

The anti-diabetic activities of *Tinospora Cordifolia* are attributed because of alkaloids (Magnoflorine, Palmetine, Jatrorrhizine), [16] tannins, cardiac glycosides, flavonoids, saponins, etc. [17] It acts as anti-diabetic drug through explanatory oxidative stress, promoting insulin secretion by inhibiting gluconeogenesis and glycogenolysis.

Guduchi has been studied for its hypoglycemic actions. The Crude extract of stem in ethyl acetate, dichloromethane (CDM), chloroform and hexane was studied for inhibition of the alpha glucosidase enzyme. The enzyme was inhibited by *Tinospora Cordifolia* and the hyperglycemic increase was decreased by 58% in diabetic animals and 50% in normal animals. Also, an aqueous extract of *Tinospora Cordifolia* was studied to test insulin resistance and oxidative stress in rats. *Tinospora Cordifolia* treatment prevented the increase in glucose by 21.3%, insulin by 51.5%, triglycerides by 54.12%, and glucose-insulin index by 59.8 of the rats fed fructose without the addition of *Tinospora Cordifolia* extract. Also, the fructose-induced abnormalities in the liver involving lipid peroxidation, protein carbonyl groups, GSH levels, and enzymatic antioxidants was found to be prevented by *Tinospora Cordifolia* treatment [18].

### Analgesic activity

The observed analgesic activity of *Tinospora Cordifolia* may be attributed because of its phytoconstituents like alkaloids, glycosides, flavonoids, steroids and terpenoids, which are present in the aerial part of the plant. The analgesic activity of flavonoid is reported which is mediated by inhibiting the production of prostaglandins [19].

### Anti-Oxidant Activity

Anti-oxidant activity of methanolic extract of stem of *Tinospora Cordifolia* has been reported, which is carried out by increasing the erythrocytes membrane lipid peroxide and catalase activity. It also decreases the activity of SOD, GPx in alloxan induced diabetic rats [20, 21]. Leaf extract of *Tinospora Cordifolia* contains an alpha-glucosidase inhibitor, characterized as saponarin was found to be also significant antioxidant and hydroxyl radical scavenging activity [22].

### Immunomodulatory Activity

*Tinospora Cordifolia* having immunomodulatory response. [23, 24] 11- hydroxymuskatone, N-methyle-2-pyrrolidone, N-formylannonain, cordifolioside A, magnoflorine, tinocordioside and syringing are responsible for immunomodulatory and cytotoxic effects [25]. These compounds improve the phagocytic activity of macrophages and increase in nitric acid production [26].

### Experimental Evaluation of Effect of Guduchi (*Tinospora cordifolia*) on Diabetic Neuropathy

The aqueous and alcoholic extract of the *Tinospora cordifolia* was found to be improve glucose tolerance in diabetic rats [27].

The chemical constituents and the medicinal properties of ethanolic extract of *Tinospora cordifolia* was studied by S.S. Singh, *et al* at a dose of 400mg/kg body weight, which produced a significant reduction of blood sugar in alloxan induced diabetic rats [28].

A study by Grover *et al* showed attenuation of experimental diabetic neuropathy by *Tinospora Cordifolia* at a dose of 400mg/kg b.w [29].

Clinical trials in the patients of diabetic peripheral neuropathy with aldose reductase inhibitor, Sorbinil (Pfizer-CP45634) have found to be significant improvement in the pain relief, motor and sensory nerve conduction velocities and have a minimum toxicity. These observations indicate that aldose reductase inhibitors may be important in the treatment of symptomatic, somatic and autonomic neuropathies complicating diabetes [30]. *Tinospora cordifolia* have an aldose reductase inhibition action that was found during the in-vitro studied. It also showed the beneficial effect of *Tinospora cordifolia* on diabetic neuropathy which appears due to its analgesic effect and unrelated to its anti-hyperglycemic effect. An anti-oxidant role of *Tinospora cordifolia* cannot be ruled out as oxidative damage contributes to the causation of diabetic neuropathy and *Tinospora cordifolia* is proven to be an anti-oxidant in experimental models [31].

### Conclusion

Guduchi is an important herb in Ayurveda which having greater medicinal value. It was found in various animal trails that Guduchi helps in reduction of blood sugar level and have an aldose reductase inhibition action. It also have anti-Diabetic, antioxidant and immunomodulatory activities, because of these properties Guduchi is helpful in the management of diabetic neuropathy. Most importantly due to its analgesic activity shows beneficial effect in the treatment of painful diabetic peripheral neuropathy.

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