IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Peripheral Diabetic Neuropathy As Madhumehajanya Upadrava: Ayurvedic Approach To Pathophysiology And Chikitsa

[1]Dr.Simaran Shahmadar [2]Dr Vikram [3]Dr. (Prof.) Pramod Kumar Mishra [4]Dr. Pooja

[1]P.G. Scholar Dept. of Kaya Chikitsa [2]P.G. Scholar Dept. of Kaya Chikitsa

[3]Professor & HOD Dept. of Kaya Chikitsa [4]P.G. Scholar Dept. of Kaya Chikitsa

[1,2,3,4]Post Graduate Institute of Ayurveda, Jodhpur, Rajasthan, India

Abstract

Peripheral Diabetic Neuropathy (PDN) is one of the most disabling microvascular complications of Diabetes Mellitus, affecting nearly 50% of long-standing diabetic patients and significantly impairing quality of life. From a modern perspective, chronic hyperglycemia leads to metabolic and vascular derangements such as polyol pathway activation, oxidative stress, accumulation of advanced glycation end products, and microangiopathy, culminating in nerve damage. In *Ayurveda*, PDN can be correlated with *Madhumehajanya Upadrava*, primarily manifesting as *Vata*-predominant disorders due to *Ojo kshaya* and *Dhatu kshaya*. Symptoms like *suptata* (numbness), *daha* (burning), *ruja* (pain), and *toda* (pricking sensations) closely resemble the clinical presentation of neuropathy.

The Ayurvedic approach emphasizes both Shodhana (purification) and Shamana (palliative) therapies. *Panchakarma* modalities such as *Basti* (particularly *Yapana and Tikta Ksheera Basti*) and *Virechana* are indicated for *Vata-Pitta* involvement. *Rasayana* drugs including *Amalaki, Guduchi, Ashwagandha, Shatavari*, and *Guggulu* yogas offer neuroprotective, antioxidant, and rejuvenative effects. Dietary regulation and lifestyle modification with regular exercise, yoga, and meditation play a supportive role.

This review attempts to correlate the modern pathophysiology of PDN with *Ayurvedic* concepts of *Madhumehajanya Upadrava*, highlighting integrative management strategies. *Ayurveda*, with its holistic approach addressing root causes, dosha balance, and tissue rejuvenation, holds promising potential in the prevention and management of peripheral diabetic neuropathy.

Keywords: Peripheral Diabetic Neuropathy, *Madhumehajanya Upadrava, Rasayana, Shodhana Chikitsa*

Introduction:

Diabetes mellitus (DM) is a chronic metabolic disorder characterized by persistent hyperglycemia resulting from defects in insulin secretion, insulin action, or both. Globally, diabetes has reached epidemic proportions, affecting an estimated 537 million adults in 2021, with projections indicating a rise to 783 million by 2045[1]. In the present era because of stressful and hectic lifestyles, most people follow faulty dietary habits, lifestyle habits, and lack of physical exercise which leads to many lifestyle disorders such as Diabetes, Obesity, and cardiovascular diseases. Out of all these disorders Diabetes mellitus has gained gigantic disgrace in recent times as it is rapidly becoming the world's largest silent killer. India has been projected as the country with the fastest-growing population of diabetic patients by WHO. As it gets chronic it leads to many complications such as Neuropathy, Nephropathy, Metabolic ketoacidosis, Retinopathy, etc. One of the most debilitating microvascular complications of DM is Peripheral Diabetic Neuropathy (PDN), which occurs in approximately 50% of patients with long-standing diabetes and is a major cause of morbidity, foot ulceration, and lower limb amputations[2]. Clinically, PDN is characterized by numbness, paraesthesia, burning pain, and loss of sensation, leading to significant impairment in quality of life[3]. From a modern biomedical perspective, the pathophysiology of PDN involves hyperglycaemia-induced metabolic and vascular pathways including polyol pathway activation, advanced glycation end product (AGE) accumulation, oxidative stress, mitochondrial dysfunction, and microangiopathy, all of which contribute to nerve fiber damage[4]. Diabetic neuropathy is a type of nerve damage that develops gradually and is caused by poor glycaemic control. Four main types of neuropathies which can impact the nervous system are as follow

1. Peripheral Neuropathy
2. Autonomic Neuropathy
3. Thoracic and lumbar root, or proximal neuropathy
4. Mononeuropathy

Diabetic Peripheral Neuropathy is defined as " The presence of symptoms and/or signs of peripheral nerve dysfunction in people with diabetes after exclusion of other causes" The prevalence of neuropathy is related to age, duration of diabetes, and quality of metabolic control. It is clinically present in 30% to 50% of all diabetic patients. The diagnosis relies on both clinical signs as well as quantitative testing and may be present despite lack of reported symptoms. Symptoms may include numbness, the sensation of tingling or sharpness, and burning that begins in the feet and spreads proximally which have similarities with the *updrava* of *Madhumeh* like *daha, suptata, harsha, shoola*, etc. *Vata* and *Pitta* are the predominant *Doshas* involved in the causation of the majority conditions of Peripheral Diabetic Neuropathy.

Aims and Objectives:

1. To review Peripheral Diabetic Neuropathy (PDN) from both modern and *Ayurvedic* perspectives, with special emphasis on its correlation with *Madhumehajanya Upadrava.*
2. To review classical Ayurvedic principles of *Shodhana* and *Shamana Chikitsa* relevant for PDN.

Material and Methods:

This review is based on classical Ayurvedic texts that describe concepts related to *Madhumeha*, its complications, and their therapeutic approaches, with a focus on correlating them to Peripheral Diabetic Neuropathy (PDN). Contemporary literature was explored through databases including PubMed, Google Scholar, and the AYUSH Research Portal to identify relevant studies and reviews on Ayurvedic management of PDN. Insights from classical sources and modern research were compiled and synthesized to develop an integrative understanding of PDN within the Ayurvedic framework and to assess its potential application in present-day clinical practice.

Ayurvedic concept of PDN:

Peripheral diabetic neuropathy is not referred to by a specific name in Ayurveda; however, its symptoms and underlying pathology are well-established and understood in the context of *Prameha*, the Ayurvedic term for diabetes mellitus, and its consequences, known as *Upadravas*. The emphasis is on how dosha imbalances, particularly between *Vata* and *Pitta*, affect the body's tissues and neurological system. Diabetic neuropathy is regarded by Ayurveda as a Prameha complications (Upadrava). Several signs and symptoms that closely mimic those of diabetic neuropathy are described in the traditional scriptures, including the *Charaka Samhita* and *Sushruta Samhita*. Such symptoms are sometimes referred to as *Prameha* prodromal signs (*purvarupa*) or complications (*upadravas*).

***Dosha* Imbalance:**

Vata Dosha: Vata dosha is considered the chief regulator of all bodily movements and is closely linked with the nervous system's activity. In diabetic neuropathy, symptoms such as numbness (*supti*), tingling sensations (*harsha*), and sharp pain or cramps (*ruja* or *toda*) arise due to the aggravated state of *Vata*. Normally, *Vata* ensures proper coordination of sensory and motor functions, but when disturbed, it impairs these mechanisms and gives rise to neurological discomforts.

***Pitta Dosha*:** Pitta governs metabolic activities and the regulation of body heat. The burning sensation (*daha*) experienced in the palms and soles, which is a frequent manifestation in diabetic neuropathy, reflects the aggravation of *Pitta*. Classical explanations describe this as the downward displacement (*ashyapakarsha*) of *Pitta* under the influence of vitiated *Vata*, which results in the characteristic burning discomfort in the extremities.

***Avarana* Pathology:** An important pathological mechanism in the progression of complications such as neuropathy is Avarana. In *Avaranajanya Madhumeha* (a subtype of diabetes), the aggravated *Kapha* and

excess *Meda* (adipose tissue) obstruct the natural pathways of *Vata*. This blockage results in *Vata* aggravation, which subsequently hampers the normal functioning of the *dhatus* (tissues) and manifests as neurological symptoms associated with nerve impairment.

Samprapti:

Prameha (Kaphaja, Pittaja, Vataja)

Vitiated *Dosha dushya* causes *Avarana to Vata*

Vata carries *dhatu* through *basti marga*

Avarana Lakshana

Dhatu Kshaya Lakshana

Madhumeha

Prakupita vata along with *kapha* circulates in *srva sharir*

Sthana samshraya in *adho shakha* (Lower limb)

Burning sensation (*Daha*), Pricking pain (*Toda*), Paraesthesia (*Pada suptata, Pada harsha*)

Pain in the distal part of the feet

Diabetic Neuropathy

Signs & Symptoms of PDN in Ayurveda

1. *Vataja Lakshana* (due to Vata vitiation)

- *Supti* – numbness/loss of sensation
- *Toda*/*Ruja* – pricking pain, sharp pain
- *Sphurana* – muscle twitching, cramps

2. *Pittaja Lakshana* (due to Pitta vitiation)

- *Daha* – burning sensation in hands and feet
- *Santapa* – warmth, increased heat in extremities

3. Kaphaja Lakshana (due to Kapha & Meda involvement)

- *Gourava* – heaviness
- *Aalasya* – lethargy
- *Shaithilya* – looseness of muscles, weakness

4. *Avaranajanya Lakshana* (due to *Avarana* of *Vata* by *Kapha* & *Meda*)

- Obstructed nerve impulses leading to sensory & motor impairment
- Gradual *dhatu kshaya* → worsening of weakness and sensory loss

Modern Perspective of Peripheral diabetic neuropathy:

Definition of Peripheral Diabetic Neuropathy (PDN):

Peripheral Diabetic Neuropathy is the most common form of diabetic neuropathy. It is defined as:

"A symmetrical, length-dependent sensorimotor polyneuropathy attributable to chronic hyperglycaemia and associated metabolic disturbances in patients with diabetes mellitus."[39]
This condition primarily affects the feet and legs, and later may involve hands and arms, leading to symptoms such as numbness, tingling, burning pain, and loss of protective sensation, increasing the risk of foot ulcers and amputations."

Key Features:

- Symmetrical: Affects both sides equally
- Length-dependent: Begins in the longest nerves (feet) and progresses upwards
- Sensorimotor: Involves both sensory (touch, pain) and motor (muscle) nerves
- Chronic complication: Develops slowly over years of poorly controlled diabetes

- The International Association for the study of pain recently established the following description of peripheral neuropathic pain in diabetes patients: "pain arising as direct consequences of abnormalities in the peripheral somatosensory system in people with diabetes.[5]

Epidemiology.

Estimates vary with population and diagnostic method, but systematic reviews report PDN prevalence commonly between ~30% (overall pooled) to >40% in some cohorts; painful PDN affects a substantial subset (estimates ~30–50% among those with neuropathy), and prevalence rises with diabetes duration and poor glycaemic control. (Use exact pooled numbers appropriate to your target population.)

Pathophysiology of PDN:

Peripheral diabetic neuropathy (PDN) is a multifactorial complication of diabetes mellitus, primarily resulting from chronic hyperglycemia. The mechanisms include:

1. **Polyol Pathway Activation**
   - Excess glucose enters the polyol pathway, where aldose reductase converts glucose to sorbitol.
   - Sorbitol accumulation leads to osmotic stress, decreased myo-inositol, and impaired Na^+/K^+ ATPase activity.
   - This results in axonal degeneration and impaired nerve conduction.
2. **Advanced Glycation End Products (AGEs)**
   - Chronic hyperglycaemia promotes non-enzymatic glycation of proteins and lipids, forming AGEs.
   - AGEs bind to their receptors (RAGE), triggering oxidative stress, inflammation, and structural changes in peripheral nerves.
3. **Oxidative Stress**
   - Mitochondrial overproduction of reactive oxygen species (ROS) damages nerve tissues.
   - ROS leads to lipid peroxidation, DNA damage, and apoptosis of Schwann cells and neurons.
4. **Ischemia and Hypoxia**
   - Hyperglycaemia causes endothelial dysfunction, thickening of the basement membrane, and microangiopathy.
   - Reduced endoneurial blood flow results in ischemia and hypoxia of nerves.
5. **Inflammatory Mechanisms**
   - Activation of nuclear factor kappa B (NF-κB) and pro-inflammatory cytokines (TNF-α, IL-6) contribute to nerve injury.
   - Chronic inflammation further amplifies oxidative damage.

6. **Mitochondrial Dysfunction**
    - Impaired mitochondrial energy metabolism decreases ATP production.
    - Neurons become more susceptible to degeneration due to energy failure.

These processes lead to axonal loss, demyelination, and impaired nerve regeneration, manifesting as numbness, burning pain, tingling, loss of reflexes, and sensory deficits in a "stocking-glove" distribution.[7,8,9]

Diagnosis:

The diagnosis of PDN is mainly clinical, supported by neurological examination and confirmatory tests. Common clinical features include numbness, tingling, burning pain, and loss of protective sensation in a stocking–glove distribution. Bedside tools such as the 10 g monofilament test, 128 Hz tuning fork, pinprick, and ankle reflex are widely used for screening. Clinical scoring systems like the Toronto Clinical Neuropathy Score (TCNS) and Michigan Neuropathy Screening Instrument (MNSI) help grade severity. For confirmation, nerve conduction studies (NCS), electromyography (EMG), and quantitative sensory testing (QST) are employed. Advanced techniques include skin biopsy, corneal confocal microscopy, and autonomic function testing for small-fiber and autonomic neuropathies.[10,11]

Management of PDN:

Management of PDN involves strict glycemic control, pharmacological therapy, lifestyle measures, and preventive foot care. Good glycemic control through medications and lifestyle changes slows progression. For neuropathic pain, pregabalin, gabapentin, duloxetine, and TCAs are commonly used; topical agents like capsaicin and lidocaine may provide local relief. Non-pharmacological approaches such as exercise, physiotherapy, TENS, and psychological support improve quality of life. Preventive strategies like daily foot inspection, protective footwear, and regular follow-up help avoid complications.

Ayurvedic Management of PDN:

Ayurvedic management of PDN focuses on *Vata* pacification, removal of *Avarana*, rejuvenation of *Dhatus*, and symptomatic relief. The line of treatment includes *Shodhana* (purification), *Shamana (*palliation), and *Rasayana* (rejuvenation).

1. *Shodhana Chikitsa* (Purificatory therapies)

- *Snehana* & *Swedana* – Oleation and sudation to pacify *Vata* and improve circulation.
- *Basti* (Medicated Enema): Considered the prime treatment for *Vata* disorders; formulations like *Dashmoola Niruha Basti, Ksheera Basti, or Madhutailika Basti* are used.
- *Virechana*: In cases with *Daha* (burning), mild purgation to eliminate vitiated *Pitta*.

2. *Shamana Chikitsa* (Palliative therapies)

- Medications for *Vata-Pitta* control:
  - *Maharasnadi Kwatha, Dashmoola Kwatha* – for Vata pacification.
  - *Amrutadi Guggulu, Kaishora Guggulu* – for inflammation and metabolic correction.
  - *Yogaraja Guggulu, Trayodashanga Guggulu* – for neuropathic pain and stiffness.
- *Ghrita* preparations: *Kalyanaka Ghrita, Panchagavya Ghrita, Sukumara Ghrita* – nourish the nervous system and act as *Rasayana*.
- Taila for external use: *Mahanarayana Taila, Shacharadi taila, Bala Taila* – for *Abhyanga* and localized pain relief.

3. *Rasayana* Therapy (Rejuvenation)

- *Ashwagandha, Shatavari, Guduchi, Amalaki* – for neuroprotection and tissue rejuvenation.
- *Brahmi, Mandukaparni* – for improving nerve function and reducing stress.

4. *Pathya-Apathya* (Diet and Lifestyle)

- Light, unctuous, warm, easily digestible diet; avoid excessive dry, cold, and spicy foods.
- Gentle exercise, yoga, and pranayama for circulation and nerve health.
- Stress management through meditation and Sattvic lifestyle.

Conclusion:

Peripheral Diabetic Neuropathy is one of the most common and debilitating complications of diabetes, significantly impairing quality of life. Modern medicine emphasizes glycaemic control, pharmacological pain management, and preventive foot care, which help in slowing disease progression and reducing morbidity. Ayurveda, on the other hand, explains PDN primarily as a *Vata*-predominant disorder with *Kapha-Meda Avarana*, and advocates a holistic approach through *Shodhana*, *Shamana*, and *Rasayana* therapies, along with lifestyle modifications. An integrative approach combining modern diagnostics and acute management with Ayurvedic principles of dosha balance and rejuvenation may offer comprehensive care and improve long-term outcomes in patients with diabetic neuropathy.

References:

1. International Diabetes Federation. *IDF Diabetes Atlas*, 10th ed. Brussels: International Diabetes Federation; 2021.
2. Pop-Busui R, Boulton AJM, Feldman EL, Bril V, Freeman R, Malik RA, et al. Diabetic Neuropathy: A Position Statement by the American Diabetes Association. *Diabetes Care*. 2017;40(1):136–54.
3. Tesfaye S, Selvarajah D. Advances in the epidemiology, pathogenesis and management of diabetic peripheral neuropathy. *Diabetes Metab Res Rev*. 2012;28 Suppl 1:8–14.
4. Feldman EL, Nave KA, Jensen TS, Bennett DLH. New horizons in diabetic neuropathy: mechanisms, bioenergetics, and pain. *Neuron*. 2017;93(6):1296–313.
5. Solomon Tesfaye, MD, FRCP, Andrew J.M. Boulton, MD, Peter J. Dyck, MD et. Al Toronto Diabetic Neuropathy Expert Group, Diabetic Neuropathies: Update on Definitions, Diagnostic Criteria, Estimation of Severity, And Treatments, Pubmed Diabetes Care. 2010 Dec; 33(12):2725.
6. Sun J, Wang Y, Zhang X, Zhu S, He H. Prevalence of peripheral neuropathy in patients with diabetes: A systematic review and meta-analysis. Prim Care Diabetes. 2020 Oct;14(5):435-444. doi: 10.1016/j.pcd.2019.12.005. Epub 2020 Jan 6. PMID: 31917119.
7. Feldman EL, Nave KA, Jensen TS, Bennett DL. New Horizons in Diabetic Neuropathy: Mechanisms, Bioenergetics, and Pain. *Neuron*. 2017;93(6):1296–313.
8. Vincent AM, Callaghan BC, Smith AL, Feldman EL. Diabetic neuropathy: cellular mechanisms as therapeutic targets. *Nat Rev Neurol*. 2011;7(10):573–83.
9. Tesfaye S, Boulton AJ, Dyck PJ, et al. Diabetic neuropathies: update on definitions, diagnostic criteria, estimation of severity, and treatments. *Diabetes Care*. 2010;33(10):2285–93.
10. Tesfaye S, et al. Diabetic neuropathies: update on definitions, diagnostic criteria, estimation of severity, and treatments. *Diabetes Care*. 2010;33(10):2285–93.
11. Pop-Busui R, et al. Diabetic Neuropathy: A Position Statement by the American Diabetes Association. *Diabetes Care*. 2017;40(1):136–54.