



**UNDERSTANDING DIABETIC PERIPHERAL NEUROPATHY IN AYURVEDIC PERSPECTIVE**

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**ABSTRACT:**

Diabetes mellitus is rising to an alarming epidemic level especially in India and more than the Diabetes itself the complications caused by the long-term suffering of Diabetes are creating a great havoc. Diabetic peripheral neuropathy is one among them. It is a nerve damaging disorder and is a result of diabetic microvascular injury involving small blood vessels that supply to the nerves. *Prameha* is the disease mostly correlated with Diabetes mellitus and the symptoms of DPN can be found mentioned under the headings of *upadrava* as well as *poorva rupa of Prameha roga*. Though the modern medical science has advanced a lot with the invention of insulin and hypoglycemics for the management of diabetes, still it is unable to provide good relief in cases of neuropathies. Lack of response and unwanted side effects from the conventionally used drugs like tricyclic anti-depressants, anti-convulsants, opiates, membrane stabilizers and anti-oxidants is forcing the need to try for alternative therapies. Hence here a study was undertaken to review the concept of Diabetic peripheral neuropathy and to understand it in ayurvedic aspect by studying and comparing the etiology, pathogenesis, clinical features etc. aspects pertaining to both Diabetic peripheral neuropathy and *Prameha roga*.

**Keywords:** Diabetic peripheral neuropathy, Prameha upadrava, Complications, Ayurvedic view

## INTRODUCTION:

Ayurveda is defined as the science of life (*Ayuh*). It gives prime importance to the protection of health of a healthy individual rather than just curing the disease of a diseased. And in Ayurveda, this is achieved through the means of following *dinacharya* (daily regimen), *rtucharya* (seasonal regimen), *sadvrutta* (good conduct) etc. mentioned by the *ayurveda acharyas*. It is described that not following these principles will lead to the causation of many diseases.

But these principles of Ayurveda are falling into oblivion in today's modern world and the modern man is going against the nature in every aspect of life whether it is regarding the food and dietetic habits, sleep habits, reduced physical activity, increased mental stress or the life style of the individuals. As a result, the world is becoming an abode for many physical and mental disorders. These disorders which arise due to improper life style, are termed as life style disorders.

Life style diseases include atherosclerosis, heart disease & stroke; obesity, Type 2 Diabetes and many other metabolic diseases among which Diabetes mellitus have been directly attributed to about 1.5 million deaths each year.<sup>[1]</sup> Its prevalence has been rising more rapidly in the whole world especially in India. According to the Diabetes International Federation, the global Diabetes prevalence in 2019 is estimated to be 9.3% (463 million people), rising to 10.2% (578 million) by 2030 and 10.9% (700 million) by 2045.<sup>[2]</sup> In India alone the prevalence of Diabetes is expected to increase from 77 million in 2019 to 134 million by 2045.<sup>[3]</sup> India has been projected by WHO as the country with the fastest

growing population of diabetic patients and also declared India as the "Diabetic capital of the world" as it accounts for 17% of the total number of diabetic patients in the world.<sup>[4]</sup>

*Prameha* is a disease described in the ancient ayurvedic scriptures and is mostly correlated with Diabetes mellitus. Its inclusion in the *astamahagadas* by the three *bruhatrayeekaras* itself reflects its significance. May be the disease was considered important because of its incurability and also the different *upadravas* (complications) caused by the long-term suffering from *Prameha* like *daha* (burning sensation), *dourbalya* (weakness), *sula* (pricking pain), *suptata* (numbness) etc.

Even according to the modern science, long-term suffering from DM leads to many complications among which the Diabetic Peripheral Neuropathy is a frequent and serious complication. It is a nerve damaging disorder and is a result of diabetic microvascular injury involving small blood vessels that supply to nerves. This causes symptoms like numbness, tingling sensation, loss of sensation and sometimes hypohesthetic pain in the lower and upper extremities.<sup>[5]</sup>

The prevalence of DPN has been estimated to be between 6% and 51% among adults with DM depending on age, duration of diabetes, glucose control etc.<sup>[6]</sup> The risk of developing neuropathy at the time of initial diagnosis is estimated to be 4% to 10% by 5 years and 50% by 25 years.<sup>[7]</sup> The lower limb amputation is 10-20-fold more common in diabetic patients as compared to non-diabetic patients.

## OBJECTIVE:

This review has been taken over with an objective of understanding the condition of Diabetic peripheral neuropathy and its pathophysiology in the ayurvedic aspect so that it can be managed well with the ayurvedic line of treatment.

**MATERIALS & METHODS:**

For this study, information has been collected from the classics of *bruhat trayees* – *Charaka Samhita*, *Susruta Samhita* & *Astanga Hridaya*, various books of modern medical science and various articles from online and offline medical journals using the key words Diabetic peripheral neuropathy, *Prameha upadrava* etc.

**Diabetes mellitus**

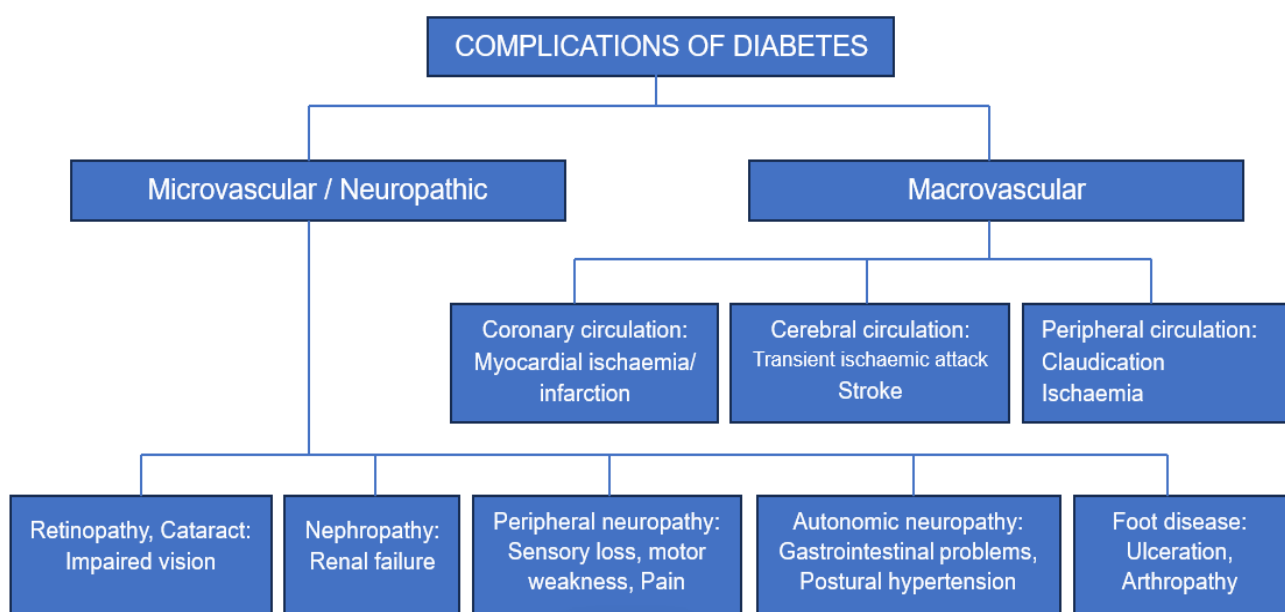
Diabetes mellitus is a clinical syndrome characterised by hyperglycemia caused by absolute or relative deficiency of insulin. Lack of insulin affects the metabolism of carbohydrate, protein and fat, and can cause significant disturbance of water and electrolyte homeostasis. Longstanding metabolic derangement is associated with functional and structural changes

in many organs, particularly those of the vascular system, which leads to the clinical complications of diabetes. These characteristically affect the eye, the kidney and the nervous system.<sup>[8]</sup>

The diagnostic criteria for Type II Diabetes includes glucose levels selected specifically because of the risk they impart for development of long-term complications. Persons whose glucose levels are elevated but who are not vulnerable to diabetes-specific complications are not considered diabetic but are described nosologically as having impaired glucose tolerance. Thus, the association of hyperglycemia with certain long-term complications is incorporated into the clinical definition of diabetes.<sup>[9]</sup>

**Complications of diabetes mellitus <sup>[10]</sup>**

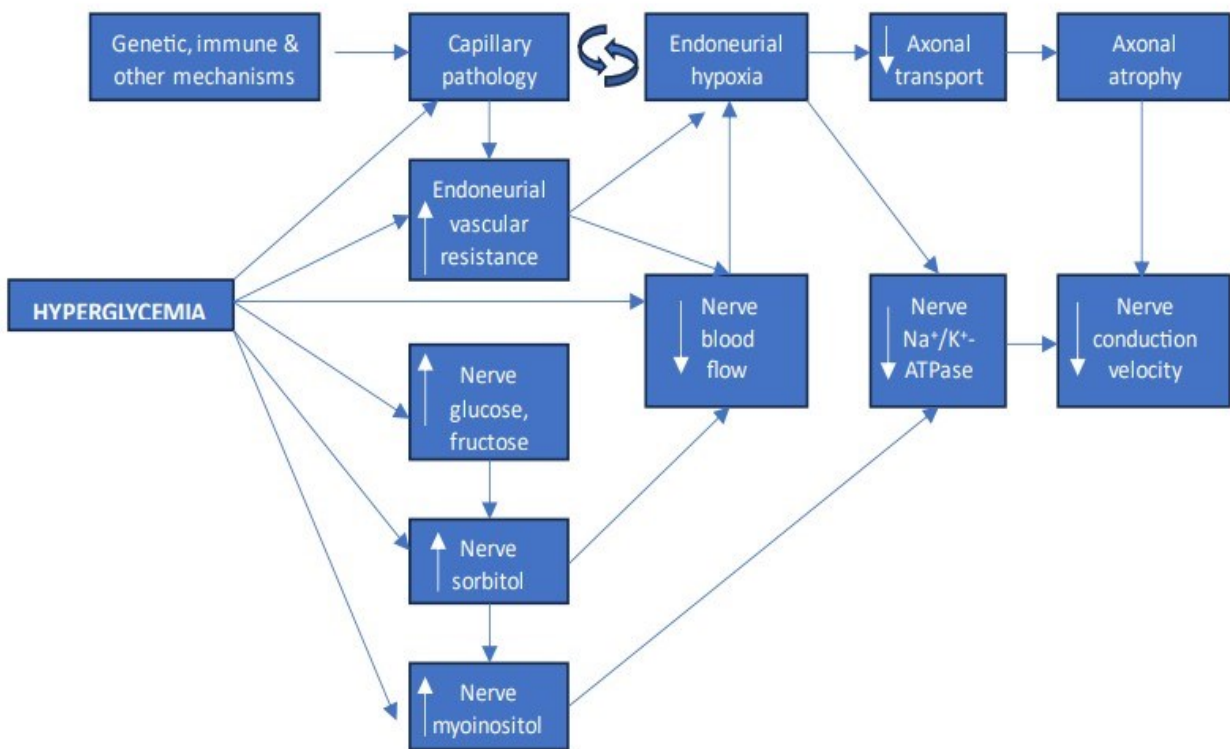
Patients with long-standing diabetes are at risk of developing a variety of complications of the disorder. Moreover, as many as 25% of people with type 2 diabetes have evidence of diabetic complications at the time of initial diagnosis.



**Figure I. Classification of complications of Diabetes**

The relationship between metabolic control and development of long-term complications of DM remains one of the most contentious issues in medicine. Whether intensive forms of diabetes therapy that have as their goal the achievement of near-normal glycemia will prevent the development or the progression of diabetes associated complications remains unanswered. Even if the relationship between

different levels of hyperglycemia and complications is established and delineated, association does not necessarily impute causation. More important, even if hyperglycemia results in the development or progression of complications, the practical questions of whether control of glucose levels will prevent or reverse complications need to be answered.<sup>[11]</sup>



**Figure II. Demonstration of pathological changes taking place in DPN**

### Diabetic neuropathy

Microvascular complications of diabetes represent one of the most serious consequences of the disease. The changes involve both the vascular cells making up the capillaries and arterioles and their basement membranes. Although all microvascular blood vessels are involved clinically, only those in the retina, renal glomeruli, and possibly the large

nerves exhibit significant pathology.<sup>[12]</sup> So when the pathology is seen in these large nerves, it is called as Neuropathy. It may manifest as polyneuropathy, mononeuropathy and/or autonomic neuropathy.<sup>[13]</sup>

The broad diversity of neurological complications in diabetic patients can be considered to consist of two distinct types. One is a transient category including acute painful

neuropathies, mono neuropathies and radiculopathies. The other is a progressive type comprising of sensorimotor polyneuropathies with or without autonomic features.<sup>[14]</sup>

### **Clinical features of diabetic peripheral neuropathy:**

The first symptoms tend to be sensory, consisting of numbness, tingling, prickling, burning or band like dysesthesias in the balls of the feet or tips of the toes, or in a general distribution over the soles. Hyperesthesia and paraesthesia also can occur. Symptoms and findings are usually symmetric and graded distally.

Neuropathic pain typically involves the lower extremities which is usually present at rest and worsens at night. Both an acute (lasting <12 months) and a chronic form of painful diabetic neuropathy have been described. As diabetic neuropathy progresses, the pain subsides and eventually disappears, but sensory deficit in the lower extremities persists. Physical examination reveals sensory loss, loss of ankle reflexes and abnormal position sense.

<sup>[15]</sup>

As worsening occurs, sensory loss moves centripetally in a graded “stocking” fashion. Later the knee jerk reflex disappears and footdrop becomes more apparent. By the time sensory disturbance has reached the upper shin, dysesthesias are usually noticed in the tips of the fingers.<sup>[16]</sup>

### **Treatment of diabetic peripheral neuropathy**

Treatment of diabetic neuropathy is directed towards optimal glycemic control and symptomatic pain suppression. Improved glycemic control will improve nerve conduction velocity, but the symptoms of diabetic neuropathy may not necessarily improve. Avoidance of neurotoxins (alcohol), supplementation with vitamins for possible deficiencies and symptomatic treatment are the mainstays of therapy.

Since the pain of acute diabetic neuropathy may resolve over the first year, analgesics may be discontinued as progressive neuronal damage from DM occurs. Chronic, painful diabetic neuropathy is difficult to treat but may respond to tricyclic antidepressants, gabapentin, nonsteroidal anti-inflammatory agents and other agents (mexiletine, phenytoin, carbamazepine, capsaicin cream)<sup>[17]</sup>

Patients with burning pain may benefit from administration of amitriptyline, but side effects often preclude treatment. Desipramine, acting by blocking norepinephrine reuptake, may be a better choice.<sup>[18]</sup>

### **Ayurvedic view**

#### **Nidana (Etiology)**

According to the modern science, the risk for the occurrence of Diabetic neuropathy increases with increasing duration and severity of hyperglycemia. Hence the factors responsible for hyperglycemia can be taken as the etiological factors for DPN.

Similarly, in Ayurveda the *upadrava avastha* of *Prameha* (which here is being

compared with the DPN) occurs as a result of increasing duration and severity of *Prameha*. As Susruta says, all types of *pramehas* if not treated in proper time, turn into *madhumeha* and then become incurable.<sup>[19]</sup> Then further if *madhumeha* is not managed properly will lead to *upadrava avastha*. So, the further aggravating factors like the *asatmendriyardha samyoga* (improper contact of sense organs with their objects) or *pragnaparadha* (intellectual errors) etc., undertaken by a *madhumehi* leads to further *dosha dushya sammurchana* (amalgamation of doshas and dushyas) thereby leading to the *dhatu kshaya* and *upadrava avastha*. Hence the causative factors of *Madhumeha* leading to the *upadrava avastha* can be considered as the etiologies of DPN.

If considered according to the *doshas*, the symptoms of DPN like tingling sensation, weakness and wasting of muscles can be mainly because of *chala, ruksha* and *laghu gunas* of *vata dosha*, symptom of burning sensation can be because of *ushna guna* of *pitta dosha* <sup>[20]</sup> and symptom of numbness can be because of both *vata* and *kapha doshas* <sup>[21]</sup> acting together. Hence it can be considered that factors provoking the *tridoshas* especially *vata* and *pitta* doshas are responsible for the causation of DPN.

### **Samprapti (Pathology)**

*Kaphaja prameha* occurs due to combination of *kapha* with the *pitta, vata & medas*

*Pittaja prameha* occurs due to combination of *pitta* with *vata, kapha, sonita & medas*

*Vataja prameha* occurs due to combination of *vata* with *kapha, pitta, vasa, majja & medas*.<sup>[22]</sup>

As the disease progresses and turns to *madhumeha* and reaches the *upadrava avastha*, *dosha dushya sammurchana* occurs in the body and all these factors viz. *shad dhatus, vasa* (muscle fat), *lasika* (lymph), *sariraja kleda* (body fluids) and *ojus* (vigor) will be affected in that particular body including the *tridoshas* of which *vata* will be the predominant one.

Here if we consider the role of *medo dhatu* in the manifestation of DPN according to the modern science, the damage to the peripheral nerves occurs by two mechanisms - loss of axons in the peripheral nerve trunk and demyelination of axons.<sup>[23]</sup> The myelin is made up of saturated very long chain fatty acids (VLCFA) and this fat is represented by *medo dhatu* in our body according to Ayurveda. Hence it can be considered that the *medo dhatu dusti* occurring in the *samprapti* of *Prameha* is leading to the damage of the peripheral nerves and causing DPN in diabetic patients.

In *Astanga hrdaya*, *Vagbhata* mentioned two types of *prameha* based on 2 different *sampraptis* causing aggravation of *vata – Dhatu kshaya janya* (depletion of *dhatu*s) & *Dosha avarana janya* (obstruction of *vata*).<sup>[24]</sup>

In *dosha kshaya janya prameha*, *ojo kshaya* occurs along with the *dhatu kshaya* and this leads to *vata prakopa*. In *avarana janya*, *vata* gets aggravated because of the obstruction by either the *pitta* or *kapha* or both and as a part of the *prameha roga* manifestation, along with the

*dhatu*s, *vasa*, *lasika*, *sharira kleda* and *ojus* get decreased as they flow out in the form of urine. In this *avarana janya samprapti*, *chala guna* of *vata* gets decreased due to *avarana* by the *pitta*, *kapha*, *rakta*, *mamsa*, *meda* etc. This causes *chestahani* and can eventually lead to disruption of motor or sensory function of *vata* and lead to the manifestation of symptoms such as numbness, paresthesia etc. Depending on all these factors, different symptoms are exhibited in the *upadrava avastha* according to the predominance of *doshas*, type of *samprapti* and the respective *dhatu*s getting affected.

From this it can also be inferred that the *dhatu kshaya janya samprapti* may be responsible for the occurrence of motor symptoms like the wasting and weakness of muscles and the *avarana janya samprapti* may be responsible for sensory motor symptoms like paresthesia, numbness etc.

**Samprapti ghatakas:**

*Dosa – Vata (predominantly Vyana vayu), Pitta, Kapha*

*Dushya – Rasa, rakta, mamsa, meda, majja, sukra, vasa, ojus, kleda, lasika.*

*Agni-Jatharagni, bhutagni, dhatvagni*

*Srotas- Rasavaha, Raktavaha, Mamsavaha, Medovaha, Majjavaha, Sukravaha srotas*

*Srotodushti – Sanga*

*Udbhava sthana – kara, pada*

*Sanchara sthana – Sarva sarira via sira, dhamani*

*Vyakta sthana – Initially kara, pada later in koshta, marma, etc internal structures*

*Rogamarga– Bahya & abhyantara*

*Sadhya-asadhyata – Kricha sadhya vyadhi*

**Poorva rupa**

Our *acharyas* have given a great importance to the manifestation of prodromal features in *Prameha roga*. A *pramehi* is defined as one who is having some or all of the prodromal features along with the *prabhuta avila mutrata* (excess and turbid urine). Also, it has been said that occurrence of all the prodromal features in a *pramehi* will make the disease incurable.<sup>[25]</sup>

Some symptoms of DPN like burning sensation (*kara pada daha*) were explained in the *poorva rupa* of *prameha*.<sup>[26]</sup> From this it can be implied that the neuropathy signs can occur in patients even before the complete manifestation of *prameha roga*. Hence the features of DPN are not only found in *upadrava avastha* but also in prodromal stage of *Prameha*. Even in modern science, the association of hyperglycemia with certain long-term complications is incorporated into the clinical definition of Diabetes. That means persons whose glucose levels are elevated but who are not vulnerable to Diabetes-specific complications are not considered diabetic but are described as having impaired glucose tolerance.

**Rupa**

*Prabhuta* and *avila mutrata* are the symptoms produced commonly in all types of *Prameha*.<sup>[27]</sup>

The symptoms such as *daha* (burning sensation), *pipeelika sancharamiva* (tingling

sensation), *soola* (pricking sensation) and *suptata* (numbness) are the major symptoms seen in DPN. Among these, *daha* occurs usually due to *prakupita pitta dosha*. *Pipeelika sancharamiva* & *soola* may occur due to *prakupita vata dosha* and *suptata* due to combination of *prakupita kapha* and *vata dosha*.

Other features like *dourbalya* (weakness in extremities), *mamsa sosha* (wasting), *kampa* (tremors) etc. can be attributed to *vata prakopa* and *dhatu kshaya*. The clinical features of DPN can be found with the following terms in ayurveda.

Table I. Comparison of symptoms of DPN with the similar features in Ayurveda		
Symptoms of DPN	Ayurvedic comparison	Found in <sup>[28-31]</sup>
Numbness	<i>Suptata, Swapana</i>	<i>Meda kshaya lakshana</i>
Burning sensation	<i>Daha</i>	<i>Pitta vruddhi lakshana</i> <i>Pittavruta vata</i> <i>Pittavruta vyana vata</i> <i>Raktavruta vata</i> <i>Prameha purvarupa</i> <i>Prameha upadrava</i>
Tingling sensation	<i>Pipeelika sancharamiva</i>	<i>Mamsavruta vata</i>
Pricking sensation	<i>Suchibhiriva nistoda</i>	<i>Raktavruta vata</i>
Pain	<i>Sula, toda, arti</i>	<i>Pittavruta vata</i> <i>Kaphavruta vata</i> <i>Raktavruta vata</i> <i>Prameha upadrava</i>
Wasting	<i>Mamsa sosha, Karshya</i>	<i>Prameha upadrava</i> <i>Vata vruddhi lakshana</i>
Weakness	<i>Dourbalya, angasada, klama, anga glani, bala bhramsa</i>	<i>Prameha upadrava</i> <i>Pittavruta vyana vayu</i> <i>Mamsa kshaya lakshana</i> <i>Vata vruddhi lakshana</i>
Involuntary movements	<i>Kampa</i>	<i>Prameha upadrava</i> <i>Vata vruddhi lakshana</i>
Heavyness of limbs	<i>Guru gatrata</i>	<i>Kaphavruta vata</i> <i>Kaphavruta vyana vata</i>

### Upadrava

Complications of *Prameha* are *trsna* (thirst), *atisara* (diarrhoea), *daha* (burning sensation),

*dourbalya* (weakness), *arochaka* (anorexia) and *avipaka* (indigestion). *Puti mamsa pidaka* (carbuncles which putrify the muscle tissues)

appear during the chronic stage of the disease.

[32]

All these upadrava conditions are as a result of some form of neuropathy in the body, either peripheral neuropathy or autonomic neuropathy among which *daha*, *dourbalya* and *pidakas* occur in peripheral neuropathy.

### **Chikitsa**

The symptoms of DPN viz. tingling sensation can be because of *vata*, burning sensation can be because of *pitta* and numbness can be because of both *vata* and *kapha*. By this way drugs which can pacify the three *doshas* especially the *vata* and *pitta hara dravyas* can be useful for the management of DPN.

And also, as the damage is caused to the peripheral nerves, drugs which act as nervine tonics and having anti-oxidant properties can be used. Various *panchakarma* procedures which can pacify the *doshas* and help in the repair and rejuvenation of the nerves especially *Abhyanga* can be used in DPN.

Immunodeficiency is commonly seen in diabetics which can be attributed to *ojo kshaya* caused in *prameha*. In advanced stages of DPN, as *vata* vitiates more due to *kshaya* and *avarana karanas*, it will further cause symptoms like *mamsa soshya*, *karshya*, *dourbalya*, etc.

Considering all these factors the treatment plan for DPN should consist *vata hara* and *pramehaghna* drugs and formulations which are also *ojo vardhaka*, *bala vardhaka*,

*dhatu vardhaka*, *jeevaniya* and *rasayana gunas* along with *tridosha hara property*.

### **DISCUSSION:**

In *Ayurveda*, detailed description of diabetes mellitus is found in the name of *madhumeha* but we do not find any direct reference for DPN. But as *Acharya Charaka* says that all the diseases need not always be assigned with a particular name, but the disease can be understood on the basis of the nature of the disease (*prakriti*), the organs involved (*adhistana*), the clinical features (*rupa*), the etiological factors (*samutthana*) as well as the vitiated *doshas* in the *pradhana vyadhi* and do the treatment accordingly.<sup>[33]</sup>

In Diabetic peripheral neuropathy, functions of peripheral nerves are impaired. As per *Ayurveda*, functions of peripheral nerves are mainly attributed to *vata dosha*, in particular to *Vyana Vata*. The *chala guna* of *vata* is said to be responsible for the transmission of nerve impulses to and from the central nervous system. Because of *avarana* factors, the *vata* gets obstructed and the *vata* loses its *chala guna* thus effecting the nerve impulse conduction.

### **CONCLUSION:**

Though the general clinical features of DM viz. polyuria, polydipsia, polyphagia etc., sound as not so serious conditions, the complications caused by the DM put it in a grave condition.

Diabetic peripheral neuropathy is a condition seen in long term chronic patients of

diabetes as well as in pre diabetic stage of the disease. Similarly, the DPN features are found both in *upadrava avastha* as well as the *poorva rupa avastha* of Prameha.

*Vyana Vayu* is mainly responsible for the coordinated action of all the body parts including the sensory and motor functions. Due to *dhatu kshaya*, *ojo kshaya* and *avarana* by different factors, the *vata* especially *vyana vata* gets obstructed and causes different symptoms of Diabetic peripheral neuropathy.

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