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EFFECT OF *UTSĀDANA* (WET POWDER MASSAGE) IN DIABETIC DISTAL SYMMETRIC POLYNEUROPATHY (DSPN)-A PRE TEST POST TEST DESIGN

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ABSTRACT

Introduction: Diabetic Distal Symmetric Polyneuropathy (DSPN) is a prevalent and debilitating complication of diabetes mellitus, often leading to serious outcomes such as diabetic foot ulcers. The condition develops gradually and typically begins in the distal parts of the lower limbs, creating "stocking and glove" pattern of sensory impairment. Conventional management strategies offer limited symptomatic relief and are frequently associated with adverse effects. In Ayurvedic literature, while DSPN is not directly referenced, it is understood under the broader context of *Prameha Upadrava* (complications of diabetes). The clinical progression typically involves an initial predominance of *Kapha dosha* (numbness or *supthi*), followed by *Pitta dosha* (burning sensation), and ultimately *Vata dosha* (pain, tingling, degeneration). Materials and Methods: This prospective single-arm pretest–post-test interventional study with follow-up included 10 patients exhibiting symptoms such as numbness, burning sensation, and aching pain. All patients tested positive on the Michigan Neuropathy Screening Instrument (MNSI) confirming the diagnosis as DSPN. The intervention included an external Ayurvedic therapy, *Utsādana* (Wet powder massage), using *Lakṣādi Cūrṇa,elādi Cūrṇa* mixed with *Ghṛita* and *Tila taila,* massaged daily 45 minutes for 14 days. Results: The treatment led to a statistically significant reduction in the Neuropathy Total Symptom Score (NTS-6) with a p-value < 0.05, indicating clinically significant in reducing the Neuropathy Total Symptom Score (NTS-6) Discussion: Diabetic neuropathy is often considered a *Kapha–Pitta or Kapha–Vāta* predominant condition, where Kapha causes *āvaraṇa* of *Vāta*. *Utsādana*, due to its *Snigdha rūkṣa* and *Kapha-hara* properties, helps remove this obstruction and alleviates the symptoms. Conclusion: This prospective single-arm pretest–post-test interventional study highlights the potential role of Ayurvedic external therapies as supportive treatments in the management of DSPN.

Key-words: *Utsādana, Lakṣādi Cūrṇa, Neuropathy Total Symptom Score (NTS-6), DSPN, Vibration Perception Threshold (VPT)*

INTRODUCTION: Diabetes mellitus, also referred to as diabetes, is a multifaceted and enduring metabolic disorder that has become a prominent global health concern[1]. The global impact of this issue is significant, affecting a large

population and presenting substantial health risks, thereby placing a considerable strain on healthcare systems[1]

Diabetes affects an estimated 537 million adults worldwide between the age of 20 to 79 (10.5% of all adults in this age range)[2]. By 2030, 643 million people will have diabetes globally, increasing to 783 million by 2045[2]. It has been shown that up to 50–66% of all diabetic patients develop some sort of diabetic neuropathy during the course of their disease[3]. The condition is characterized by nerve damage and dysfunction, which can lead to pain, paraesthesia, muscle weakness, and autonomic dysfunction[4]. Polyneuropathy is a common and debilitating complication of Diabetes Mellitus, affecting more than half of all Diabetic patients. In *Dhātu-kṣaya janya prameha*, *Ojas* diminishes along with *Dhātus*, leading to *Vāta prakopa*. In *āvaraṇa janya prameha*, *Vāta* gets aggravated due to obstruction by pitta, kapha, or both, and along with the *Dhātus*, *Vasa*, *Lasikā*, *Śarīra Kleda*, and *Ojas* are lost through urine. The *Āvaraṇa* reduces the *chala guṇa* of *vāta*, causing *Cheṣṭāhāni* and disturbance of motor or sensory functions, resulting in symptoms like numbness and paraesthesia. Thus, *Dhātu-kṣaya janya samprapti* may lead to motor manifestations such as muscle wasting and weakness, while *Āvaraṇa Janya Samprapti* may produce sensory-motor symptoms like numbness and paresthesia[5].

Currently available drugs are often ineffective and complicated by adverse events, hence treatments not entirely satisfactory. Considerable number of patients are seeking nonpharmacologic/alternative medical systems for their management[6]. Distal symmetric polyneuropathy (DSPN) is an important area of research in Ayurveda, particularly in relation to complications of *Prameha*. Previous studies on external therapies have mainly focused on *rūkṣa* procedures like *Udvartana*, based on the assumption of *Kapha* predominance in the pathology of *Prameha*. Interventions such as *Udgharṣaṇa with Triphala cūrṇa*, *Triphala cūrṇa with dhānyamla*, and *Triphala cūrṇa with taila* have shown encouraging outcomes in conditions like *Prameha* and Sthoulya[7-8]. However, classical Ayurvedic texts indicate a predominance of *Vāta* in DSPN, and they also caution against excessive *Apatarpaṇa* in *Prameha* as it may lead to complications like *mutragraha, ruja, gulma,* and *kṣaya*[9]. Considering this, some authors recommend *snigdha*-based procedures. *Utsādana* combines the mechanical action of *Udvartana* (upward rubbing) with a *snigdha medium*, thereby allowing controlled administration of unctuousness, which may be beneficial in managing complications of *Prameha*. Although classical texts mention *Utsādana* in *Prameha*, studies evaluating its effect in DSPN are lacking; therefore, the present study was undertaken to assess its efficacy in DSPN.

This clinical study presents 10 participants with diabetic Distal Symmetric Polyneuropathy (DSPN) who was treated using Ayurvedic wet powder massage (*Utsādana*). The therapy involved powder massage with *Lākshadi Curna*, *Eladi curna* mixed with ghee and sesame oil. Following the treatment, the participants experienced significant improvement, including a reduction in numbness, burning sensation, and tingling pain. These findings suggest

that Ayurvedic management can be an effective approach for alleviating the signs and symptoms of DSPN, offering a natural and potentially safer alternative to conventional treatments.

AIM AND OBJECTIVES

- To find out the effectiveness of *Lākshadi Curna*, *Eladi curna Utsādana* in reducing the signs and symptoms of Diabetic distal symmetric polyneuropathy
- Role of *Lakshadi, Eladi curna Utsādana* in reducing VPT (Vibration Perception Threshold) and Monofilament test

MATERIALS AND METHODS

This clinical study involved 10 participants diagnosed with Diabetic Distal Symmetric Polyneuropathy (DSPN) who attended the outpatient department of VPSV Ayurveda College, Kottakkal. The diagnosis was confirmed using the Michigan Neuropathy Screening Instrument (MNSI). Patients presented with symptoms such as numbness, burning sensation, aching pain, and tingling sensation. All participants were receiving hypoglycaemic therapy for the management of diabetes mellitus during the study period. The study followed a single-arm pretest–post-test design, where baseline assessments were carried out prior to the intervention and the outcome measures were reassessed after completion of the treatment.

Inclusion criteria:

- Participants fulfilling the diagnostic criteria
- Aged 35 – 70 years
- Gender- no discrimination
- Participants who have given informed consent

Exclusion criteria

- Known cases of another peripheral neuropathy
- Participants with hypersensitivity of skin, dust allergy
- Active Diabetic foot ulcers, infection and amputation of lower limbs
- H/O use of sedative treatments, hypnotics, anticonvulsants in the past 7 days

Ethical consideration:

- Ethical committee clearance was obtained with IRB No- IRB/Cl/19/23 dated 10/10/2023.

Informed consent:

- Informed consent was obtained from each participant. A case record form was maintained separately for each participant.

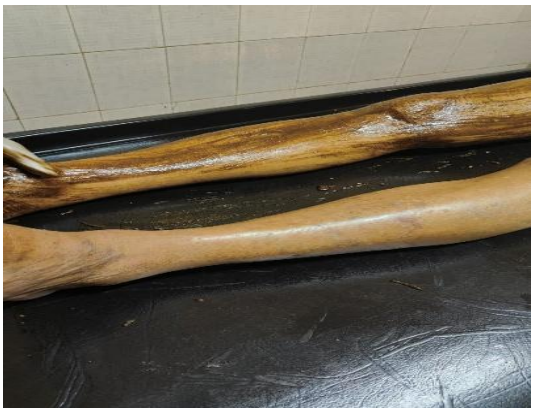
Intervention: The intervention, *Utsādana*, used in this case, is a massage technique described in classical Ayurvedic text *Chikitsamanajari*[10]. The treatment involved massaging with a paste made from *Lakshādi Curna*, *elādi curna* mixed with equal amounts of pure ghee and sesame oil Table-1).

Table no-1 Amount of medicine used[10]

Sl. No	Medicine / Ingredient	Quantity per Day	Total for 14 Days (Approx.)
1	*Lakṣādi Cūrṇa*	120 g	~2 kg
2	*Elādi Cūrṇa*	30 g	~500 g
3	*Tila Taila*	150 ml	~2 Liters
4	*Ghṛita*	150 ml	~2 Liters

The patient was seated on a massage table with legs extended, and the paste was gently massaged onto the lower limbs using moderate pressure. The strokes were applied in an upward direction, following the *Prathiloma* (opposite to the direction of hair follicles) direction. The massage was performed in seven different postures, including sitting, supine, left lateral, supine, right lateral, supine, and sitting again. After the procedure, the body was wiped dry with a clean cloth, and the patient was advised to rest for an hour before taking a lukewarm water bath. Each session lasted 45 minutes and was conducted daily for a total of 14 days. **Figure 1 medicine used**

Figure 2 Procedure of *Utsādana*



Outcome measures:

Assessments were conducted three times: at baseline, immediately after the intervention, and 14 days post-intervention. Improvement in clinical symptoms was observed using the Neuropathy Total Symptom Score-6[11]. A clinically significant reduction in Neuropathy Total Symptom Score was noted.

For semi-quantitative sensory testing using a Biothesiometer[11], the probe tip was initially placed on the patient's palm and hand, with vibration strength increased to 15 volts to help them recognize the sensation. A check button ensured the patient could distinguish between touch and vibration perception. Once familiar with the procedure, the probe was applied to the foot, and voltage was gradually increased from zero. The patient was asked to focus and report when they felt vibrations. The check key verified responses—pressing it should not produce vibration, while releasing it should. Readings were taken at six-foot sites, and an average value was calculated (fig 1).

For the Semmes Weinstein monofilament test[12], the monofilament was first applied to the inner wrist to familiarize the patient with the sensation. It was then applied to ten specific sites on each foot with enough pressure to bend the filament. These included nine plantar sites - the distal great toe, third toe, fifth toe, first, third, and fifth metatarsal heads, medial and lateral foot, and heel - along with one dorsal site. The patient was asked to acknowledge each touch (fig 2)

Data analysis:

The data obtained from the study was organized and recorded in an Excel spreadsheet. Statistical analysis was performed using SPSS 20 software.

OBSEVATION AND RESULTS

A clinically significant reduction in Neuropathy Total Symptom Score was noted[11] (Table 2). Monofilament testing

indicated improved pressure perception (Table 4), while the most remarkable improvement was seen in vibration perception (Table 3).

Semi Quantitative Sensory Testing – Biothesiometer[12]

The probe tip was initially applied on the participant's palm and hand and the vibration strength was increased to 15 Volts to make the participant feel the vibration. The CHECK button was used to make sure the participant differentiates between the touch and vibration perception. After sensitizing the participant to the procedure, the probe top was placed on the foot. The voltage was increased from zero gradually. The participant was asked to concentrate on the foot and inform once they feel the vibration. When the Check key is pressed, the participant should not get the vibration and when released they should feel the vibration. In this way the readings were obtained. VPT was checked on 6 sites in each foot, an average was calculated. The 6 sites on which it was tested are shown in figure.

Semmes Weinstein monofilament testing[13]

The monofilament was initially applied on the inner wrist so the participant, so that she/he knows what to expect. Then the monofilament was applied on 10 sites of each foot with sufficient force to cause the filament to bend. The participant was asked to identify each time they were touched. The 10 sites on which it was tested are shown in figure

Table 2- Neuropathy Total Symptom Score

	NTS (6)		
Patient number	BT	AT	AF
1	13	6	7
2	9	5	5
3	8	4	4
4	9	4	4
5	10	8	8
6	11	4	4
7	9	1	1
8	11	2	2
9	13	4	4
10	8	5	5

Table 3 vibration perception threshold by Biothesiometer

Patient No:	BT (in volt.)	AT (in volt.)	AF (in volt.)
1	33.5	26.5	26.5
2	26.2	26.5	27.5
3	22.6	23	23.6
4	32.5	25.8	24
5	32.25	28.5	29
6	33.66	27	28

7	28.08	21.6	23
8	38	24	24.5
9	23.5	18.5	19
10	30.83	25.6	26.5

Figure 3- Sites used for testing vibration perception threshold[14] 1B- Biothesiometer[15] (instrument used for measuring VPT)

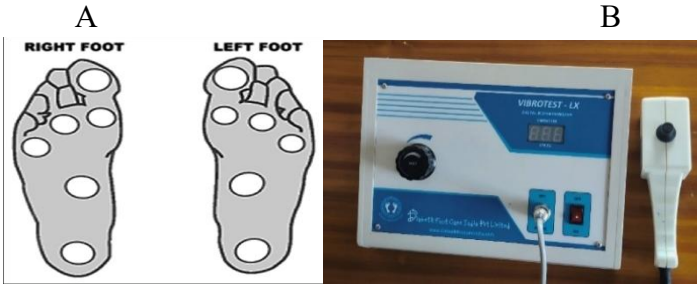
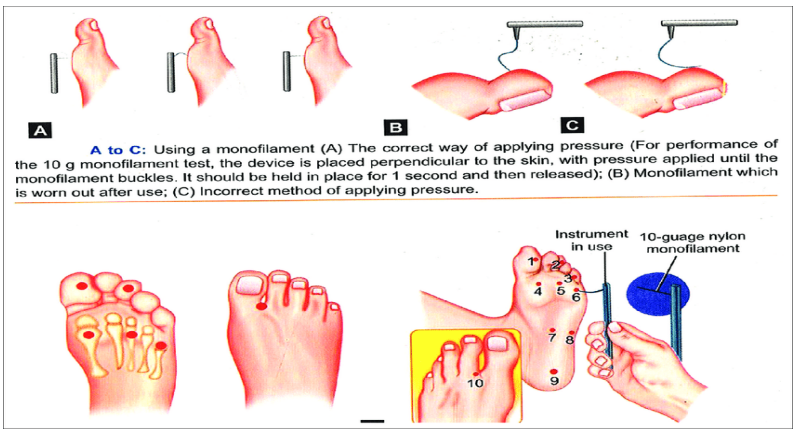


Table 4- Monofilament test

Patient no:	BT	AT	AF
1	7	9	9
2	7	8	8
3	8	8	8
4	7	9	9
5	8	8	8
6	9	9	10
7	5	9	9
8	5	8	8
9	7	9	9
10	7	9	9

Figure 4- Sites used for Semmes Weinstein monofilament testing figure 2B- Monofilament test[16]



DISCUSSION

The commonest of Diabetic neuropathy is Distal Symmetrical Polyneuropathy (DSPN), which is caused by damage to small and large peripheral nerve fibres [17]

Diabetic polyneuropathy, also known as chronic distal symmetrical polyneuropathy (DSPN) is currently defined as a symmetrical length dependent sensorimotor polyneuropathy attributable to metabolic and micro vessel alterations as a result of chronic hyperglycaemia exposure and cardiovascular risk covarieties[18]

The American Diabetes Association's (ADA) definition of DSPN for clinical practice is "the presence of symptoms and/or signs of peripheral nerve dysfunction in people with diabetes after the exclusion of other causes"[19].

In Ayurveda, neuropathy can be understood in relation *to Prameha Poorvarupa* (premonitory signs of diabetes) and *Upadrava* (complications). Since both microvascular and macrovascular changes contribute to its pathology, the disease process can also be analysed through the lens of *Vatarakta Samprapti* (pathogenesis of gout-like disorders involving Vata and Rakta). As the disease progresses over time, *Vata dosha* tends to become more predominant, influencing the severity of symptoms.

The present study has an objective of reducing the vibration perception threshold by biothesiometer. Vibration perception thresholds at low frequencies seem to be a better indicator of the risk of developing diabetic foot ulcers, gait or balance problems or weakness of the foot[20]. There is a 5.6% increase in the likelihood of ulceration for every 1 V increase in VPT[21]. Conversely, for every 1 V decrease in VPT, the risk of ulceration should be decreased by 5.6%[22]. Damaged nerve fibres cause difficulty in conducting signals related to vibration, resulting in loss of vibration sensation. *Udgharṣaṇa* (dry powder massage) or *Utsādana* (wet powder massage), through *Siramugha Vivitatwa* (opening of channels of circulation), improves blood supply to the lower limbs, thereby providing neuronal nourishment[23]. Additionally, ingredients like Ashwagandha have neuroprotective action, while *Mudga* and *Masha* act on neuronal inflammation[24,25,26]. All these factors, in turn, help improve vibration perception.

Improving the value of semiquantitative test- Semmes Weinstein monofilament (SWM) and thereby reducing the risk of diabetic foot ulcers. Peripheral neuropathy increases the risk of diabetic foot, especially with poor sugar control, leading to higher morbidity and mortality. Early screening for diabetic polyneuropathy is essential for better foot care and reducing complications[27]. Abnormal SWM test results in diabetic participants are linked to increased oxidative stress, suggesting it may play a role in nerve damage[28]. Thus, improvement in the SWM test indicates a reduced risk of diabetic foot, less pain, lower risk of falls, and improved quality of life[29]. A pathological SWM test result indicates a high risk for foot ulcers (*Prameha pidaka*). In *Prameha Pidaka*, disease progresses to the *twak* and *mamsa* dhatus and tends to localize in the lower limbs due to weakness in the *ayanas*[30]. The *ayanas* or *dhamanis* (channels) include *rasa, pitta, kapha*, and *rakta*, and any disturbance in their function promotes ulcer formation[23]. Therapeutic measures like

Udgharṣaṇa (dry powder massage) or *Utsādana* (wet powder massage) (massaging or rubbing in the upward direction) are advised, as they help to reverse the downward movement of aggravated doshas and support healing. As the procedure *Utsādana* possesses *Gourava*, *Tandra Hara*, *Kapha-Medo Vilayana*, and *Vatahara* properties, along with stimulation of *Twakstha Bhrajaka Pitta* (skin metabolic functions)[23], it helps in improving sensations, thereby leading to improvement in the SWM test.

The neuropathic symptoms observed in the patient, such as numbness (*Supti*) and heaviness (*Gourava*), can be correlated with *Kaphavrita Vata*, where Kapha obstructs the normal functioning of Vata[31]. Similarly, burning sensations *(Daha)* and discoloration, which are indicative of Pitta imbalance, can be associated with *Pittavrita Vata*, where Pitta interferes with Vata's natural movement[32]. Given that the patient primarily experienced burning sensations along with Vata-related symptoms like aching pain, sharp shooting pain, and gradual wasting (leaning) of the lower limbs, it suggests a condition progressively shifting toward *Vata predominance.*

Therefore, a treatment approach balancing all three doshas (*Tridosha Samana Chikitsa*) should be considered. In particular, therapies and medicines that are *Rakta Prasadana* (blood-purifying) and help in removing *Avarana* (pathological obstruction) are crucial for managing such conditions effectively.

Udwartana is known for its *Kapha-Medohara* (Kapha and fat-reducing) and *Vatahara* (Vata-pacifying) properties, making it effective in removing *Avarana* (obstructions in bodily channels). Additionally, it helps dilate blood vessels, thereby enhancing circulation and promoting *Rakta Prasadana* (purification of blood). It also possesses *Twakprasadana* (skin-nourishing) properties[23]. *Utsādana*, a subtype of *Udwartana*, involves the use of unctuous substances mixed with herbal powders[29]. In this case, the procedure performed was *Utsādana* using *Lakshadi Curna*, combined with ghee and *Tila Taila* (sesame oil) to enhance its therapeutic benefits[10].

Lakshadi Curna consists of *Laksha, Mudga, Ashwagandha, Masha, Tugaksheeri,* and *Amalaki,* as mentioned in *Chikitsa Manjari* under the *Prameha Prakarana*[30]. This *Utsādana Yoga* is also referenced in other contexts, such as the management of *Vatavyadhi Upadrava* (complications of Vata disorders), suggesting its effectiveness in *Vata-Pitta* predominant conditions.

For enhanced therapeutic benefits, *Lakshadi Curna* is combined with *Eladi Gana Churna***,** ghee, and *Tila Taila* **(**sesame oil**)**. Most ingredients in *Lakshadi Curna* are *Tridosha-hara* (balancing all three doshas) or specifically *Kapha-Vata hara*, while the herbs in *Eladi Churna* are also *Tridosha-hara* or *Kapha-Pitta hara*[30]. This combination helps in alleviating neuropathic symptoms effectively. Additionally, the inclusion of ghee and sesame oil provides a soothing effect, helping to mitigate *Paittika (Pitta*-related) symptoms like burning sensations[33].

Besides that, *Aswagandha*[24], *Amalaki* [34] both have an antioxidant, anti-inflammatory effect which helps in improving diabetic neuropathic symptoms.

One of the commonly used complimentary and integrative practice in diabetic neuropathy is foot massage. Foot reflexology applied to patients with diabetic neuropathy causes improvement in

pain, glycaemic control, nerve conductivity and heat and vibration sensitivities[35]. Self-foot massage was an effective approach in improving the pain levels of the patient[36]. A clinically significant reduction was noted in neuropathy total symptom score, The pressure perception, vibration perception was observed in wet powder massage with *Triphala curna* and *Dhanyamla*[37].

CONCLUSION

The study indicates that *Lakṣādi Cūrṇa Utsādana* is effective in reducing the signs and symptoms of Diabetic Distal Symmetric Polyneuropathy. Improvement was observed in symptoms such as numbness, burning sensation, tingling, and pain. A reduction in Vibration Perception Threshold (VPT) and improvement in monofilament test findings also suggest better sensory perception. However, further studies with larger sample sizes are needed to confirm these findings.

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