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Hydrotherapy with Herbs for Reducing Peripheral Neuropathy Pain in Diabetics

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Abstract

Introduction: Diabetic Neuropathy is nerve damage due to metabolic disorders related to DM, 30-50% of patients with DN experience pain, and most often spontaneous burning pain in the legs. DN pain is a condition of concern, has a negative impact on QoL, morbidity and mortality.

Objective: to further analyze the efficacy and safety of hydrotherapy with herbal foot spa to reduce peripheral leg pain in DPN patients

Methodology: Patients were given written information and instructions, asked to fill out a questionnaire and document it in a diary that was equipped with an implementation guide. Patients were asked to fill out a diary, which contained complaints before and after and developments for 8 weeks which were carried out independently and made grub via WhatsApp to monitor and communicate and counsel. The type of data collection is a study by correspondence. And divided into 3 groups: group 1 with hydrotherapy action without herbs, group 2 with hydrotherapy and herbs action, group 3 is the control group only taking medicine from a doctor group 1, 2, 3 doing sports 3 times a week. After 8 months GDA, HbA1C and NSS were examined.

Findings: This study shows that foot health in diabetics who receive herbal hydrotherapy has less complaints of pain compared to foot exercises and hydrotherapy without herbs.

Keywords: Hydroterapy1, Herb2, Peripheral Neuropaty Pain3

1. Introduction

The disabling and life-threatening complications of Diabetes Mellitus (DM) include Diabetic Neuropathy (DN) (International Diabetes Federation, 2019). DN is nerve damage due to metabolic disorders related to DM, around 60% - 70% with a certain degree and sensory neuropathy that most affects DM sufferers (Lewis, Dirksen, Heitkemper, & Bucher, 2014). The prevalence of DN ranges from 16% - 87% (IDF, 2019), 30-50% of patients with DN experience pain, and most often spontaneous burning pain in the legs (Feldman et al., 2019). DN has symptoms of pain and numbness in the legs and feet to problems with the digestive system, urinary tract, blood vessels and heart (IDF, 2019). Pain described as an unpleasant prickling sensation in the hands, feet (Gylfadottir et al., 2019) and DM sensorimotor polyneuropathy which often causes pain (Peltier et al., 2014). DN pain is a condition of concern, has a negative impact on QoL, (Aslam et al., 2014) morbidity, considerable mortality (Iqbal et al., 2018) is the main driver in managing DN pain (Spallone, Lacerenza, Rossi, Sicuteri, & Marchettini, 2012).

DN treatment usually focuses on pain control, along with risk factor modification (Zakin et al., 2019), requiring admission to a pain referral center (Vanja Basić-Kes et al., 2011). Proper management of DN pain is important. Treatment of DN pain, both pharmacological and non-pharmacological. A number of symptomatic pharmacological agents are available for pain control. The aim of pharmacotherapy is to maximally reduce DN pain and commensurate with the side effects (Vanja Basić-Kes et al., 2011), it takes the best combination to reduce DN pain (Peltier et al., 2014). In the treatment of DN, pain specialists began to combine hydrotherapy and herbal therapy, in China it has been developed for thousands of years because hydrotherapy with herbs not only increases microcirculation (Matsumoto et al., 2010), it also increases skin permeability to enhance drug absorption, which is efficiently in the lower extremities. In addition, this action reduces collaterals due to blood stasis, which will prevent the flow of QI and blood from reaching the extremities causing numbness and pain. several herbs have shown efficacy to improve microcirculation (Xu WG, 2007).

Several studies have shown that foot soak therapy with herbs is efficacious for the treatment of DPN. However, this study was not well designed and did not provide convincing clinical data to support the application of herbal foot baths (Xiong GH, Li Y, 2015). In this study, besides doing hydrotherapy with herbs, clients get consultations both in person and online with the forward chaining application with best first search which is designed to facilitate periodic monitoring and as a remaindering activity. The composition of the herbal bath consists of lemongrass, black cumin, ginger, cinnamon, black cumin, Epsom salts, turmeric, apple and Lombok vinegar and ice cubes which can improve blood flow and reduce pain. The researcher's preliminary study showed that herbal foot spa foot baths showed local microcirculation, relieved clinical symptoms of DPN, and effectively increased nerve conduction velocity in DPN patients (Fan GJ, Tang XY, Liu ZJ, et al. 2011). However, this preliminary study was limited by a small sample size, one site and a non-double-blind design. Therefore, a multi-site, double blind, randomized, controlled clinical trial is needed to further determine the efficacy and safety of herbal foot spas for the treatment of DPN treated with herbal foot spas will have more positive clinical outcomes than patients receiving control drugs. The purpose of this study was to analyze the effectiveness of herbal hydrotherapy to reduce pain in diabetic peripheral neuropathy.

2. Materials and methods

To find out the effectiveness of hydrotherapy with herbal ingredients, the researchers conducted a preliminary study on patients at the Puskesmas. Sampling using simple random sampling technique by selecting respondents according to the criteria, namely 60 respondents

2.1 Materials

The patients were given written information and instructions, asked to fill out a questionnaire and document it in a diary that was equipped with an implementation guide. Patients were asked to fill out a diary, which contained complaints before and after and developments for 8 weeks which were carried out independently and made grub via WhatsApp to monitor and communicate and counsel.

2.2 Data collection procedures

The type of data collection is a study by correspondence. And divided into 3 groups: group 1 with hydrotherapy action without herbs, group 2 with hydrotherapy and herbal action, group 3 is the control group only taking medicine from a doctor group 1, 2, 3 doing sports (foot exercises) 3 times a week. After 8 months, GDA, HbA1C, and ABPI were examined.

Sufferer

The inclusion criteria were patients with diabetic peripheral neuropathy, while the exclusion criteria were cases of severe paresis.

Intervention hydrotherapy steps with herbs : 1) Patients are given written instructions and hydrotherapy applications, 2) Prepare a container that has been given ice cubes half of the basin to soak, 3) Add Epsom salt and herbal ingredients (turmeric, black cumin, Lombok, cinnamon, dlingu, ginger) and apple cider vinegar, 4) Soak your feet by reaching the surface a few centimeters below the knee, 5) Inform the patient of the initial reaction, namely initial vasoconstriction followed by hyperemia which lasts longer and systemic vegetative reactions including neurohormonal and lower limb circulatory reactions, 6) Add plain water / low pressure cold water to avoid mechanical stimulation of the skin, starting from the right side of the forefoot, then aiming up the calf above the knee basin, and let it sit for 10 seconds and down on the inside of the calf side. Then the procedure is repeated in the same way on the front side and after that the other leg. All procedures should not take more than one minute, 7) Soak your feet for 10-30 seconds and end immediately if you feel cold pain, 8) To soak the feet alternately, using two basins/buckets, one with ice water with a temperature of 100C and one with warm water with a temperature of 360C. alternate between starting with a warm bath for 3 minutes, one switching to a cool bath for about 20 seconds. Start with warm water first and then cold water to induce a reaction after cold stimulation.

Notebook and questionnaire

The questionnaire via Google form is equipped with demographic data, general condition, emotional state, physical activity, use of nicotine, alcohol, PNP history, medical history, and are there any symptoms of pain, paresthesias, numbness, paresis, other complaints, and mood disturbances. Using a Linkert scale from zero to six was carried out before and after the action for 8 weeks. Patients are asked to record in the notes the time and type of application, complaints before the action and changes in pain, hyperesthesia and paresthesia (does not change, increases or decreases) after the hydrotherapy action, when taking analgesics must also be recorded

2.3 Data analysis

Data were analyzed descriptively, using a T-Test, paired where appropriate. The outcome parameters were symptom scores before and after the procedure, the course of symptoms was recorded in a diary, the number of applications and changes in initial symptoms after hydrotherapy. The level of adherence (frequency of application) and the question of tolerability were used as a measure of practicality.

3. Results and discussion

3.1 Results and discussion

We received complete questionnaires from 60 patients (3 males, 57 females). The average age of the patients was 65 years, the ABI examination showed that most of the patients had mild peripheral arterial disease, and the GDA examination of elderly patients showed signs of early diabetes.

Table 1. GDA Frequency Distribution

GDA	Frequency
< 200	7
200-300	30
> 300	23

Based on Table 1, the results of the study obtained from GDA <200 in 7 patients, GDA 200-300 in 30 patients and >300 in 23 patients.

Table 2. HbA1C Frequency Distribution

HbA1C	Frequency
Normal	3
Pre Diabetic	12
Diabetic	45

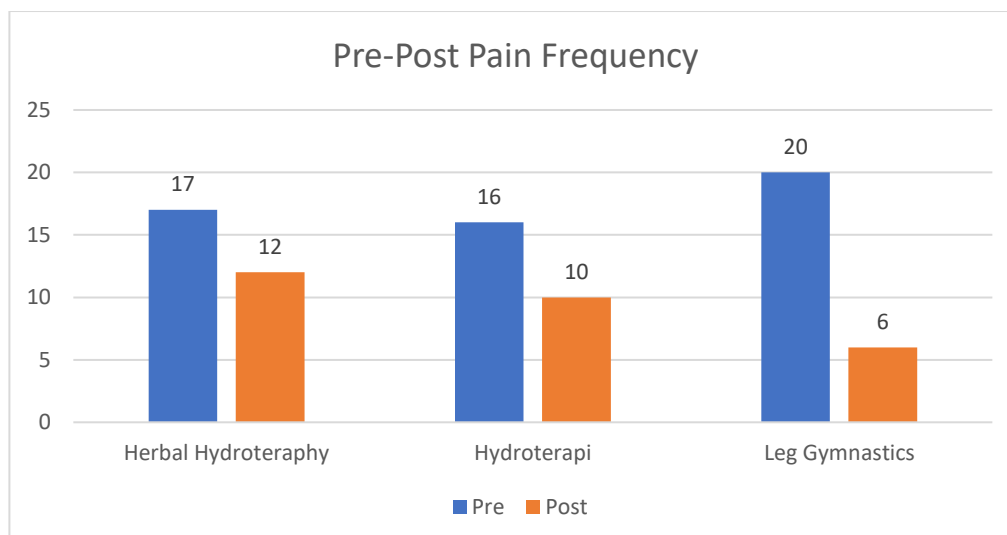
Based on Table 2, the results of the HbA1c study were obtained: 3 patients with normal, 12 patients with prediabetes and 45 patients with diabetes.

Table 3. ABPI Frequency Distribution

ABPI	Frequency
Normal	7
Acceptable	3
Mild	10
Medium	16
High	24

Based on Table 3, the results of the ABPI study were obtained: 7 patients with normal, 3 patients with acceptable, 10 patients with mild, 16 patients with medium, 24 patients with high.

Figure 1. Pre-Post Pain Frequency



Based on Figure 1, above in herbal hydrotherapy there were 17 patients who experienced pain, after being given this therapy there were 12 patients whose pain was reduced. Above in hydrotherapy there were 16 patients who experienced pain, after being given this therapy there were 10 patients whose pain was reduced. above in Leg Gymnastics there were 20 patients who experienced pain, after being given this therapy there were 6 patients whose pain was reduced.

Table 4. The effect of herbal hydrotherapy on reducing pain levels

	Paired Difference						t	df	Sig (2-taile)
	Mean	Std Deviation	Std Error Mean	95% Convindence Interval Of The Difference					
				Lower	Upper				
Pair 1 Pre-Post	8.588	2.694	0.653	7.703	9.973	13.144	16	0.000	

Based on table 5 it can be seen that the results of the statistical t test obtained a significance value = 0.000 (P-Value <0.05) which means that H_a is accepted so that there is an effect of Hydrotherapy with Herbs for Reducing Peripheral Neuropathy Pain in Diabetics

Table 5. The effect of hydrotherapy on reducing pain levels

	Paired Difference						t	df	Sig (2-taile)
	Mean	Std Deviation	Std Error Mean	95% Convindence Interval Of The Difference					
				Lower	Upper				

Pair 1 Pre- Post	9.450	3.200	0.720	8.300	10.600	14.144	16	0.035
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Based on table 5 it can be seen that the results of the statistical t test obtained a significance value = 0.000 (P-Value <0.05) which means that Ha is accepted so that there is an effect of Hydrotherapy for Reducing Peripheral Neuropathy Pain in Diabetics

Table 6. The effect of Leg Gymnastics on reducing pain levels
Paired Difference

	Mean	Std Deviation	Std Error Mean	95% Convidence Interval Of The Difference		t	df	Sig (2- taile)
				Lower	Upper			
Pair 1 Pre- Post	10.121	4.100	0.823	9.212	11.314	15.210	16	0.057

Based on table 5 it can be seen that the results of the statistical t test obtained a significance value = 0.000 (P-Value <0.05) which means that Ha is accepted so that there is an effect of Leg Gymnastics for Reducing Peripheral Neuropathy Pain in Diabetics

3.2 Results and discussion

Assessment of pain scores before and after being given a foot soak with herbs

The results of the study obtained data before soaking the feet there were 17 patients who experienced pain, after being given herbal hydrotherapy there were 12 patients whose pain was reduced. Neuropathic pain can be spontaneous or physical arousal which can manifest as increased sensitivity to pain (hyperalgesia) or as pain elicited by non-painful stimuli (allodynia) (Gilron I, Watson CPN et al, 2006). Once the injury occurs, inflammation and recovery processes ensue, leading to a hyperexcitable state known as peripheral sensitization. Many types of peripheral mechanisms have been described; in most patients, this condition resolves when healing occurs and the inflammation subsides. The use of natural products, especially medicinal herbs is one of the ancient therapies used by humanity (Li JW-H, Vederas JC, 2009). Over the past few years, most people have used herbal medicines because of lower complications and fewer side effects than drug use (Boyd et al., 2019) The herbal composition for hydrotherapy is Apple Cider Vinegar helps reduce nerve pain by alkalizing the body, removing toxins, and delivering various vitamins and minerals to the body to remedy nutritional deficiencies that can increase nerve pain. Epsom Salt helps relieve sore muscles, relieve pain, reduce swelling and increase magnesium levels. Turmeric antinociceptive properties of curcumin can reduce mechanical allodynia and are cooling and weaken the concentration of serum cyclooxygenase 2 (COX-2) in neuropathic pain. Black cumin contains antioxidants, whose oxidative effects can reduce neuropathic pain besides being able to increase serum glucose and increase lowered serum insulin concentrations. Lombok contains capsaicin which helps reduce the strength of pain signals sent throughout the body. Cinnamon helps reduce blood glucose levels and thereby prevent the development of neuropathic symptoms. Dlingu has been shown to have allodynia and mechanical hyperalgesia in neuropathic pain induced by transection of the tibial and sural nerves (TST) on anions, total calcium levels and myeloperoxidase (MPO) activity. Furthermore, HAE-AC decreased superoxide anion, total calcium and (CCI) levels. It reduces pain threshold including thermal, mechanical hyperalgesia and thermal, chemical, tactile allodynia. Increases

nociceptive and neuroprotective pain threshold (Muthuraman & Singh, 2012). Ginger has anti-inflammatory and antioxidant effects. This should reduce reactive oxygen species (ROS) and oxidative stress resulting in decreased cell hypoxia and lowered sFlt-1 levels.

Assessment of pain scores before and after being given a foot soak with warm water

The results of the study obtained data before soaking the feet there were 16 patients who experienced pain, after being given herbal hydrotherapy there were 10 patients whose pain was reduced. The decrease in the pain score is due to the warm effect that is caused when soaking the feet which causes a feeling of comfort, relaxes making it easier in and hydrotherapy is a technique for relieving pain and treating diseases that has a therapeutic effect causing relaxation in the muscles affecting the limbic system so that you feel comfortable (Permady, 2015; Apriliani, 2018). Hydrotherapy provides a physiological effect on the body in the form of relaxation, hydrotherapy distributes a feeling of warmth through the skin on the feet which has a phenosus nerve, from this nerve the stimulation is passed on to the posterior horn then proceeds to the spinal cord then to the dorsal roots then to the ventro basal thalamus which affects the hypothalamus to produce the hormone melatonin and then the brain responds by causing a synthetic effect which can provide a sense of comfort (Dionesia, 2017; Prananto, 2016; Utami & Suratini, 2 015; Permady, 2015). The use of warm water for treatment in hydrotherapy is a hydrostatic and hydrodynamic effect. Scientifically, warm water has a physiological impact on the body, in the blood vessels, warm water can improve blood circulation. When in water, energy or heat exchange occurs through the mechanisms of conduction, convection, radiation, and evaporation. Water is an absorbent medium, producing heat which has a therapeutic effect. The muscle relaxation that is obtained can increase the flexibility of the tissues and affect the limbic system so that we feel comfortable and the emotional stress disappears. By immersing the limbs in water, it will restore a weak body to become strong, reduce spasms in the nerves and muscles, normalize heart rate, anxiety and insomnia (Rinawati, & Isnaeni, 2012; Darmadi, 2017; Putra, 2018).

Assessment of pain scores before and after being given foot exercises

The results of the study obtained data before foot exercise there were 20 patients who experienced pain, after being given this therapy there were 6 patients who experienced pain. Foot exercises that are recommended for people with diabetes mellitus who experience neuropathy are foot exercises (Soegondo, et al, 2009). Foot exercise is an activity or exercise performed by patients with diabetes mellitus to prevent injury and help improve blood circulation in the legs (Widianti & Proverawati, 2010). According to Waspadji (2012) foot exercise is one of the therapies given by a nurse which aims to improve blood circulation which is disturbed, because diabetic foot exercise can help improve blood circulation which is disturbed and strengthen the small muscles of the feet in patients with diabetes mellitus with neuropathy. Besides that, it can strengthen the calf and thigh muscles, also overcome the limitations of joint motion and prevent deformities

4. Conclusion

The results of this study indicate that the combination of Hydrotherapy and herbal interventions is very helpful in reducing neuropathic pain in Diabetes Mellitus patients. These findings provide evidence that Hydrotherapy with herbs may be effective for non-pharmacological interventions and help future clinical treatments compared to Hydrotherapy with warm water and foot exercises.

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Conflict of interest

The authors declare that there is no conflict of interest and the final manuscript of this paper has been approved by all authors

References

- Aslam, A., Singh, J., & Rajbhandari, S. (2014). Pathogenesis of painful diabetic neuropathy. *National Library of Medicine*. <https://doi.org/10.1155/2014/412041>
- Boyd, A., Bleakley, C., Hurley, D. A., Gill, C., Hnnon-Fletcher, M., Bell, P., & McDonough, S. (2019). Herbal Medicinal Products or Preparations for Neuropathic Pain. *Cochrane Library*, 2019(4). <https://doi.org/10.1002/14651858.CD010528.pub4>
- Gylfadottir, S. S., Weerachoenkul, D., Andersen, S. T., Niruthisard, S., Suwanwalaikorn, S., & Jensen, T. S. (2019). Painful and non-painful diabetic polyneuropathy: Clinical characteristics and diagnostic issues. *Journal of Diabetes Investigation*, 10(5), 1148–1157. <https://doi.org/10.1111/jdi.13105>
- Matsumoto, S., Shimodozono, M., Etoh, S., Shimozono, Y., Tanaka, N., & Kawahira, K. (2010). Beneficial Effects of Footbaths in Controlling Spasticity After Stroke. *International Journal of Biometeorology*, 54(4), 465–473. <https://doi.org/10.1007/s00484-009-0300-x>. Epub 2010 Feb 17.
- Muthuraman, A., & Singh, N. (2012). Acute and sub-acute oral toxicity profile of *Acorus calamus* (Sweet flag) in rodents. *Asian Pacific Journal of Tropical Biomedicine*, 2(2), S1017–S1023. [https://doi.org/https://doi.org/10.1016/S2221-1691\(12\)60354-2](https://doi.org/https://doi.org/10.1016/S2221-1691(12)60354-2)
- Peltier, A., Goutman, S. A., & Callaghan, B. C. (2014). Painful diabetic neuropathy. *National Library of Medicine*, 348, g1799. <https://doi.org/10.1136/bmj.g1799>
- Vanja Basić-Kes, Zavoreo, I., Rotim, K., Bornstein, N., Rundek, T., & Demarin, V. (2011). Recommendations for Diabetic Polyneuropathy Treatment. *National Library of Medicine*, 50(2), 289–302. <https://pubmed.ncbi.nlm.nih.gov/22263398/>
- Xu WG. Sixty-one patients with diabetic peripheral neuropathy treated by Tongluo Yangyin recipe. *Chin J Integr Med*. 2007;13:190–194. doi: 10.1007/s11655-007-190-x. [PubMed] [CrossRef] [Google Scholar]
- Xiong GH, Li Y. Research situation of treating diabetic peripheral neuropathy with traditional Chinese medicine leg and foot bathing therapy. *Glob Tradit Chin Med*. 2015;8:609–612. [Google Scholar]
- Zakin, E., Abrams, R., & Simpson, D. M. (2019). Diabetic Neuropathy. *Seminars In Neurology*, 39(5), 560–569. <https://doi.org/10.1055/s-0039-1688978>