International Journal of Educational Research and Development
www.journalofeducation.in
Online ISSN: 2664-7095; Print ISSN: 2664-7087
Received: 02-05-2019; Accepted: 03-06-2019; Published: 10-06-2019
Volume 1; Issue 3; 2019; Page No. 05-08

Effectiveness of monochromatic infrared phototherapy for diabetic peripheral neuropathy among type II diabetes mellitus clients at selected rural areas

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Abstract
Diabetes is a growing challenge in India with estimated 8.7% diabetic population in the age group of 20 and 70 years. Diabetic peripheral neuropathy is considered one of the most common long-term micro vascular complications of diabetes mellitus regardless of type affecting up to 50% of people with diabetes. The need for the study was to determine the effectiveness of monochromatic infrared phototherapy for diabetic peripheral neuropathy among type II diabetes mellitus clients at selected rural areas.
Objectives: To assess the pre test and post test level of the peripheral neuropathy of type II Diabetes mellitus clients in both the groups. To determine the effectiveness of monochromatic infrared phototherapy for diabetic peripheral neuropathy among type II diabetes mellitus clients in experimental group. To associate the post test level of diabetic peripheral neuropathy with selected demographic variable of type II diabetes mellitus clients.
Methodology: Research approach: quantitative approach, quasi experimental research design was used for 60 samples by Non-probability purposive sampling technique.
Results: It shows that the post test mean score in the experimental group was 9.50±2.71 and the post test mean score in the control group was 16.10±2.49. The mean difference score was 6.60 (26.4%) and that the demographic variable socio economic status had shown statistically significant association with post test level of peripheral neuropathy at $p<0.05$ level.

Keywords: Monochromatic infrared phototherapy, diabetic peripheral neuropathy, type II diabetes mellitus

Introduction
Diabetes mellitus describes a group of metabolic diseases which cause high blood sugar levels. In recent years, diabetes has become one of the leading causes of deaths worldwide. According to the World Health Organization, around 1.6 million people worldwide died due to diabetes in 2016. It is estimated that 425 million people are living with diabetes all over the world. By 2045, projections show this number rising to some 629 million diabetics globally (World health organization 2018)
Nearly 98 million people in India may have type 2 diabetes mellitus by 2030, the number of people with type 2 diabetes worldwide using insulin in 2030 would double (from around 38 million to 79 million). The main risk factors occur in developing countries and will be due to population growth, ageing, unhealthy diets, obesity and sedentary lifestyles. By 2025, while most people with diabetes in developed countries will be aged 65 years or more, in developing countries most will be in the 45-64 year age bracket and affected in their most productive years(India today 2018).
Diabetic peripheral neuropathy is a nerve damaging disorder associated with diabetes mellitus. This is considered one of the most common long-term micro vascular complications of diabetes mellitus regardless of type affecting up to 50% of people with diabetes. The onset of diabetic neuropathy is usually insidious and heralded by sensory symptoms such as numbness and diminished sensation in lower limbs that start in the toes and progress proximally in a symmetrical distribution.

Diabetic peripheral neuropathy is the third most common neurological complication of long-term diabetes mellitus, which subsequently leads to foot ulceration. Most of these complications result in amputation of part of the foot or leg. It has been estimated that at least 171 million people worldwide would suffer from diabetes mellitus by the year 2030 and around 50% of them would develop peripheral neuropathy. Therefore, prevention and treatment of neuropathy is vital. Until now, however, no appropriate treatment that could treat or reverse neuropathy once it has set in exists.
Monochromatic infrared therapy could promote nerve growth and reestablish nerve membrane potentials that had been reduced by the hypoxic conditions associated with diabetes. Moreover, physical therapy methods and exercise are often used to decrease pain and increase balance in patients with Diabetic peripheral neuropathy.

Need For The Study
Diabetes mellitus is bound to result in severe complications of the vascular system, affecting multiple organs. There is a growing need for the early detection, due to the nature of pathogenesis of the disease. Hence early detection is the key to prevent the onset of complications, and reduce the morbidity and mortality associated with diabetes. The adults are at normal risk for diabetes must undergo every three years and adults with a positive family history and other risk factors should undergo screening at one or two year interval. Studies have proven that

one-thirds of all the people with diabetes remain undiagnosed and more than 60% of the newly diagnosed individuals are unaware of the condition until a complication appears (American Diabetes Association 2017) [9]

Diabetes is a growing challenge in India with estimated 8.7% diabetic population in the age group of 20 and 70 years. The rising prevalence of diabetes and other non communicable diseases is driven by a combination of factors - rapid urbanization, sedentary lifestyles, unhealthy diets, tobacco use, and increasing life expectancy. According to ICMR and public health foundation report says that diabetic prevalence has increased by 64% across India (ICMR 2017) [17].

The study suggests that, there are 62.4 million people living with diabetes in India. T2DM is a progressive disease and hampers the quality of life of the patients due to micro and macrovascular complications .Lower extremity disease, including peripheral neuropathy, foot ulceration, peripheral arterial disease, or lower extremity amputation, is twice as common in diabetic persons compared with non diabetic persons and it affects 30% of diabetic persons who are older than 40 years. In persons with diabetes mellitus, the annual population-based incidence of foot ulcer ranges from 1.0% to 4.1%, and the prevalence ranges from 4% to 10%, which suggests that the lifetime incidence may be as high as 25%, hence clinical trial evidence for the efficacy of screening strategies has demonstrated reduced incidence of amputation and ulceration, and screening for neuropathy is recommended in clinical practice guidelines. (ICMR 2017) [17]

Since patients with Diabetic peripheral neuropathy often have concomitant decreased capillary blood flow to tissues of the feet and impaired circulation to the peripheral nerves, it is plausible that improved oxygenation and nutrition related to nitric oxide metabolism related to Monochromatic infrared therapy could promote nerve growth and reestablish nerve membrane potentials that had been reduced by the hypoxic conditions associated with diabetes. Moreover, physical therapy methods and exercise are often used to decrease pain and increase balance in patients with Diabetic peripheral neuropathy.

Statement of the problem

Effectiveness of monochromatic infrared phototherapy for diabetic peripheral neuropathy among type II diabetes mellitus clients at selected rural areas.

Objectives

- To assess the pre test and post test level of the peripheral neuropathy of type II Diabetes mellitus clients in both the groups.
- To determine the effectiveness of monochromatic infrared phototherapy for diabetic peripheral neuropathy among type II diabetes mellitus clients in experimental group.
- To associate the post test level of diabetic peripheral neuropathy with selected demographic variable of type II diabetes mellitus clients.

Methods and materials used

The research approach used in the study was quantitative approach using quasi experimental research design. The study was conducted at selected rural areas with 60 samples. Out of which 30 belongs to experimental group and 30 belongs to control group and the samples were selected using non-probability purposive sampling technique. The tool used for the study was demographic variable and Michigan neuropathy screening instrument to assess the level of diabetic peripheral neuropathy was used to collect the data. Informed consent was obtained and the monochromatic infrared phototherapy was given for 15 to 20 min for alternative days in a week and it was given for four consecutive weeks for experimental group, the health education were given to the control group and at the end of 4 weeks the post test was done for both the groups and the data was analyzed using descriptive statistics.

Description of the instrument

Section- A

It deals with the demographic variables like gender, age, socio-economic status, educational status, occupation, income, marital status, dietary pattern, family history of DM, duration of diabetes mellitus and BMI**.**

Section- B

Michigan neuropathy screening instrument- it consists of two components they are history taking and physical assessment

History taking

It consists of 15 yes/no questions which are related to the signs and symptoms of diabetic peripheral neuropathy.

Physical assessment

It consists of 5 components namely appearance of feet, ulceration, ankle reflexes, vibration perception at great toe and monofilament test.

Score Interpretation

- Less than 50%- mild diabetic peripheral neuropathy
- 51- 75%- moderate diabetic peripheral neuropathy
- Above 75%- severe diabetic peripheral neuropathy.

Results

The study findings shows that 20(66.67%) had moderate diabetic peripheral neuropathy, 9(30%) had severe diabetic peripheral neuropathy and only one (3.33%) had mild diabetic peripheral neuropathy in the experimental group, and 22(73.34%) had moderate diabetic peripheral neuropathy, 7(23.33%) had severe diabetic peripheral neuropathy and only one (3.33%) had mild diabetic peripheral neuropathy in the control group.

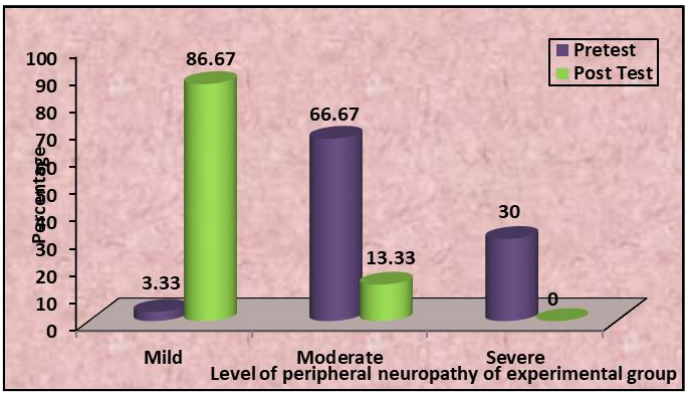

Fig 1

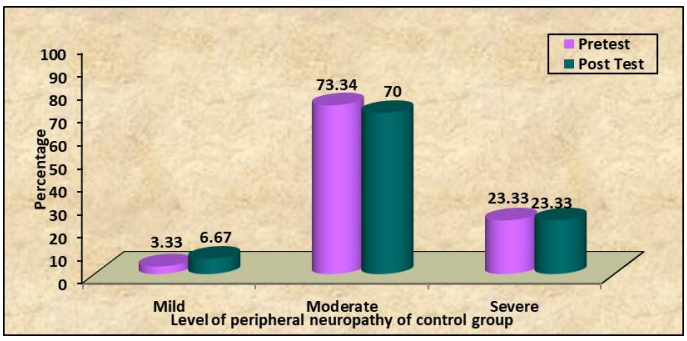

Fig 2

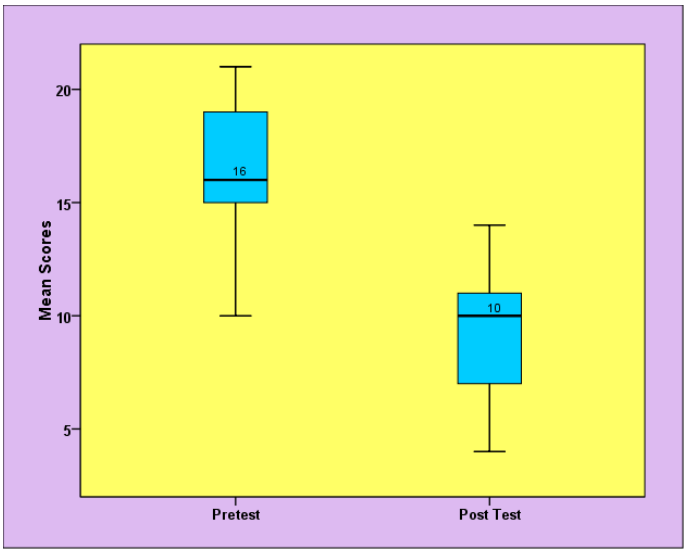

Fig 3

The post test mean score in the experimental group was 9.50±2.71 and the post retest mean score in the control group was 16.10±2.49. The mean difference score was 6.60 (26.4%).

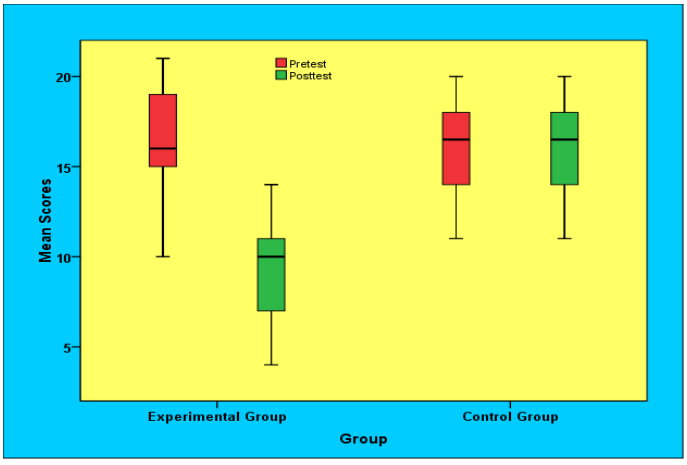

Fig 4

Discussion

Diabetes mellitus is reaching potentially epidemic proportions in India. The level of morbidity and mortality due to diabetes and its potential complications are enormous, and pose significant healthcare burdens on both families and society. Worryingly, diabetes is now being shown to be associated with a spectrum of complications and to be occurring at a relatively younger age within the country. In India, the steady migration of people from rural to urban areas, the economic boom, and corresponding change in life-style are all affecting the level of diabetes.

The first objective was to assess the pre test and post test level of the peripheral neuropathy of type II Diabetes mellitus patients.

The main study shows that in the pretest level of peripheral neuropathy, 20(66.67%) had moderate diabetic peripheral neuropathy, 9(30%) had severe diabetic peripheral neuropathy and only one (3.33%) had mild diabetic peripheral neuropathy in the experimental group. And in the pretest, 22(73.34%) had moderate diabetic peripheral neuropathy, 7(23.33%) had severe diabetic peripheral neuropathy and only one (3.33%) had mild diabetic peripheral neuropathy in the control group. In post test after the administration of monochromatic infrared phototherapy, 26(96.67%) had mild diabetic peripheral neuropathy and 4(13.33%) had moderate diabetic peripheral neuropathy in the experimental group.

This study was supported by Sonalika Gogia (2017) In view of the growing burden of type 2 diabetes mellitus (T2DM) globally and associated microvascular and macrovascular complications, the study was done to assess the prevalence and risk factors for diabetic neuropathy among T2DM patients attending a tertiary care hospital. T2DM patients' ≥30 years of both gender, presenting to the Medicine Department at a tertiary care hospital were included in the study. Diabetic Neuropathy Symptom (DNS) questionnaire to assess symptoms and Diabetic Neuropathy Examination (DNE) scoring to assess clinical signs were used. A total of 273 patients were included. The mean age was 57.8 ± 11.5 years. The male to female distribution was 75% (202) and 25% (71), respectively. According to DNS instrument, 41.4% patients scored positive for the presence of neuropathy while only 24.5% had neuropathy according to DNE score. The proportion of males affected by neuropathy was more than females. 43.1% males had a positive DNS score while only 27.2% of them had a positive DNE score. Duration of the disease was positively correlated with neuropathy.

The second objective of the study was to to determine the effectiveness of monochromatic infrared phototherapy for diabetic peripheral neuropathy among type II diabetes mellitus clients in experimental group.

The main study shows the pretest mean score was 16.43±2.53 and post test mean score was 9.50±2.71. The mean difference score was 6.93 i.e., (27.72%).The calculated paired‘t’ value of t = 22.602 was found to be statistically highly significant at p<0.001 level. This clearly indicates that the administration of monochromatic infrared phototherapy to the patients was found to be effective in reducing the level of peripheral neuropathy among type II diabetes mellitus patients in the experimental group.

This study was supported by *Robinson, et.al.,* (2017) [12] conducted a meta analysis randomized control trial to determine the effectiveness of monochromatic infrared phototherapy in patients with diabetic peripheral neuropathy. 2549 records identified, six studies met the selection criteria, with 304 patients (594 feet) randomized. MIRE was not associated with

improvement in plantar tactile sensitivity subgroups of studies with short-term (up to 2 weeks) follow-up showed significant improvement in plantar sensitivity.Neuropathic pain increased significantly in patients who received MIRE, low quality of evidence.

Conclusion

This study concludes the majority of type II diabetes mellitus clients have the signs and symptoms of diabetic peripheral neuropathy and they are unaware of their condition. It is necessary to screen the diabetic clients for diabetic peripheral neuropathy; hence various complications can be prevented.

Recommendation

1. The similar study can be conducted as a true experimental study
2. The study can be done on a larger number of samples.
3. A comparative study can be conducted with other interventions for diabetic peripheral neuropathy
4. A longer period of intervention can be studied for more reliability and effectiveness of the study.

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