

Original Article

Literature Review: Foot Exercise Prevents the Risk of Neuropathy on Diabetes Mellitus Patient

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Abstract

Aims : Diabetes mellitus is a disease in which the body cannot automatically control glucose in its blood, a complication that often occurs in the lower limbs called diabetic feet. This study aims to determine the risk of neuropathy in type 2 diabetes mellitus sufferers who perform diabetic foot exercises.

Design : The research design is the Literature Review type of Narrative Review.

Methods : The literature search in this literature review uses two databases with high and medium quality criteria, namely Scopus, and Google Scholar, using keywords technique in English which arranged into one search sentence are "Foot Diabetic Exercise "OR" Foot Exercise "AND" Prevention "OR" Prevent "OR" Avoid "AND" Neuropathy" AND" Risk of Neuropathy "OR" "low situational self esteem".

Results : The number of samples was 7 articles whose research title was about the effect of diabetic foot exercise on the risk of neuropathy in type 2 diabetes mellitus sufferers in the last ten years of publication.

Conclusions : Diabetic foot exercises to reduce the risk of neuropathy in type 2 diabetes mellitus sufferers.

Keywords

Foot exercise, neuropathy, diabetes mellitus, type 2 diabetes mellitus

INTRODUCTION

Diabetes mellitus (DM) is a disease, in which the sufferer's body cannot automatically control the glucose in the blood. This condition can cause complications that develop gradually. These complications arise in the blood vessels, nerves, eyes, kidneys and cardiovascular. Complications that often occur in the lower limbs are called diabetic feet. In these conditions, there is fatigue in blood vessels, and neuropathic innervation disorders that can cause diabetes patients to experience decreased leg sensitivity, loss of sensation is one of the main risk factors for diabetic ulcers (1).

Prevention of DM in principle is to make lifestyle changes that include exercise, weight loss, and dietary regulation. In an analysis of a group of people with intensive lifestyle changes, diabetes prevention was most associated with weight loss. Weight loss of 5-10% can prevent or slow the emergence of type 2 diabetes. A healthy diet, which

consists of complex carbohydrates, contains little saturated fat and is high in soluble fiber. Physical activity by exercising regularly at least 150 minutes per week, divided 3-4 times a week. Exercise can improve insulin resistance that occurs in pre-diabetic patients, increase levels of HDL (good cholesterol), and help achieve ideal body weight. In addition to exercise, it is also recommended to be more active during daily activities, for example by choosing to use the stairs instead of the elevator, walking to the market instead of using a car, and so on (2).

The most common complication in DM sufferers is pathological changes in the lower limbs called diabetic feet. One type of exercise that is recommended for diabetes mellitus is foot exercises. Leg gymnastics is an exercise for people with diabetes or non-sufferers to prevent injuries and help blood circulation in the legs (3).

Diabetic foot gymnastics is an exercise that is performed by moving the muscles and joints of the feet which aims to improve blood circulation, strengthen small muscles, prevent leg deformities, increase calf and thigh muscle strength, and overcome limited joint motion. The sensitivity of the contracting muscle cells to insulin will increase so that high blood glucose levels in the blood vessels can be used by the muscle cells for energy. Decreasing blood glucose levels will reduce the build-up of glucose, sorbitol, and fructose in nerve cells. This will improve circulation and nerve cell function or increase nerve sensitivity in the feet and reduce the risk or prevent the occurrence of diabetic foot ulcers (4).

The description above is our background to carry out research during the COVID-19 pandemic as it is today by carrying out a Literature Review because this is one of the alternative methods that can be used by researchers to remain productive in conducting research.

METHODS

The research design used is the literature review method (literature study). A literature review is an overview of theories, findings, and other research articles obtained from reference materials as a basis for research activities. The literature review contains reviews, summaries, and the author's thoughts on several library sources (such as articles, books, information from the internet, etc.) about the topics discussed in the research. The purpose of this method is to get an overview related to research that has been done by other people before. Library search is useful to avoid duplication of research implementation and to find previously completed research (5).

There are several sources that can be taken when conducting a literature review, for example from national and international journals using several databases, namely ProQuest, Garuda, and Google Scholar, which are concerned with the results of research on low impact exercise in hypertension. The search for articles is limited in the past 3 years, namely from 2017-2020.

Search articles or journals using keywords and boolean operators (AND, OR NOT or AND NOT) which are used to expand or specify the search, making it easier to determine the articles or journals used. The keywords in this literature review are adjusted to the Medical Subject Heading (MeSH) and consist of the following:

Tabel 1.
Literature Review's Keywords

Foot Exercise	Neuropathy	Diabetes Mellitus
<i>Foot exercise</i>	<i>Neuropathy</i>	<i>Diabetes Mellitus</i>
<i>OR</i>	<i>OR</i>	<i>OR</i>
<i>Foot exercise</i>	<i>Neuropathy</i>	<i>Type 2 Diabetes Mellitus</i>

The strategy used to find articles using the PICOS framework, which consists of:

- Population/problem is the population or problem that will be analyzed in accordance with the themes that have been determined in the literature review.
- Intervention is an action to manage individual or community cases as well as an explanation of the management of the study in accordance with the themes that have been determined in the literature review.
- Comparison is an intervention or other management that is used as a comparison if there is no one who can use the control group in the selected study.
- Outcomes are the results or outcomes obtained in previous studies that are in accordance with the themes that have been determined in the literature review.
- Study design is the research design used in the article to be reviewed.

A summary of the description can be seen in table 2

Tabel 2.
Format PICOS dalam Literature Review

Kriteria	Inklusi	Ekklusi
<i>Population</i>	<i>Studies comprised affected communities with DM</i>	<i>Communities not affected with DM</i>
<i>Intervention</i>	<i>Foot exercise</i>	<i>Other</i>
<i>Comparators</i>	<i>No comparator</i>	<i>No comparator</i>
<i>Outcomes</i>	<i>Foot exercise can prevent neuropathy</i>	<i>No</i>
<i>Study Design and publication Type</i>	<i>Quasi-experimental studies, randomized control and trial, literature review, qualitative research and cross-sectional Studies</i>	<i>No exclusion</i>
<i>Publication years</i>	<i>2017-2020</i>	<i>Pre-2017</i>
<i>Language</i>	<i>English, Indonesian</i>	<i>Other</i>

Based on the results of literature searches through publications in the Google Scholar and Scopus databases, and using adjusted keywords, the researchers found 153 articles that match these keywords. The search results that have been obtained were then checked for duplication, it was found that 68 articles were the same so they were

excluded and the remaining 85 articles. The researcher then conducted a screening Based on the title, 50 articles were issued so that there were 35 articles with relevant titles, then a selection was made based on the abstract and 7 abstracts and 28 full texts were issued, their eligibility was reviewed, 21 articles were issued and the remaining 7 articles were in accordance with the theme of the literature review. The assessment that was carried out based on the eligibility of the inclusion and exclusion criteria found as many as 10 articles that can be used in the literature review. The results of the study article selection can be illustrated in the flow diagram below:

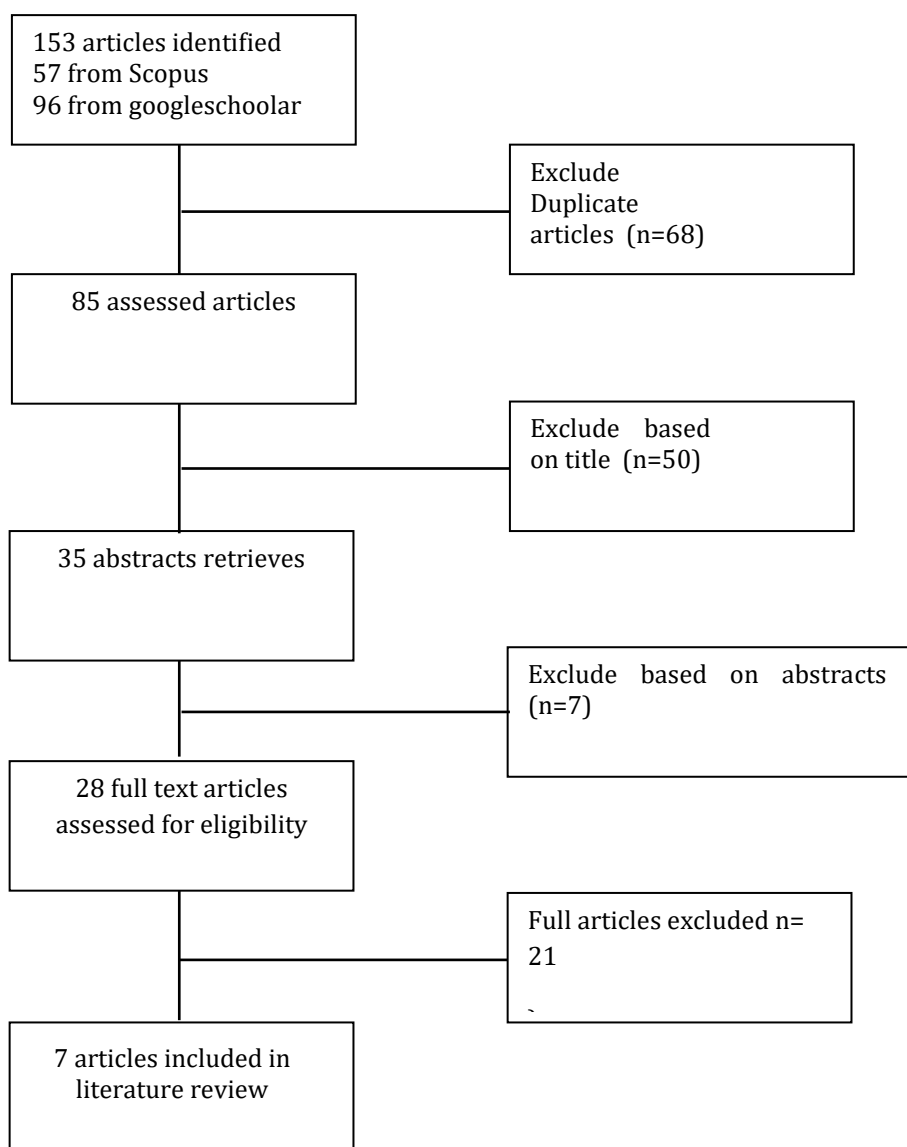


Diagram 1. Illustrated Articles Selection

RESULTS

Seven articles met the inclusion criteria for the topic of literature review, all studies were reviewed using a quasi-experimental research design. The average number of respondents was 48 people. Overall, each study discusses foot exercise with regard to peripheral circulation. All studies were carried out in Indonesia.

Tabel 3.
The Result of Articles Review

No	Authors and years	Study design, Sample, Variable, Instrument, Analysis	Outcome of Analysis Factors	Summary of Results
1	2	3	4	5
1	(Sanjaya, 2019) ⁴	Design: Quasi-experimental with Non equivalent control group design Sample: purposive sampling amounted to 26 people Variable: Independent: Foot exercise, Dependent: Sensitivity of the feet Instrument: The assessment instrument used a score of protective foot sensation measured using a homemade 10-g monofilament Analysis: Wilcoxon and Mann-Whitney U test with a degree of significance $\alpha \leq 0.05$	Foot sensitivity was better in type 2 DM patients who were given diabetic foot exercises with p-value = 0.000.	There is a significant effect of diabetic foot exercise on foot sensitivity in type 2 DM patients
2	(Desy Indah Ratnawati, 2017) ⁶	Design: quasy experiment design with one group method pre test - post test Sample: 30 participant of foot gymnastics at Puskesmas Sibela Variable: Independent: Foot gymnastic, dependent: peripheral neuropathy Instrument: Skor Diabetic Neuropathy Examination Analysis: from 30 respondents is obtained a mean diabetic examination neuropathy score before foot gymnastics was 7,67 with a standard deviation of 2,63 and after foot gymnastics was 5,37 with a standard deviation of 2,632.	From the paired t test analysis was obtained p = 0,001 (p<0,05)	Influence foot gymnastic against a decreased risk of peripheral neuropathy based on diabetic neuropath examination scores.
3	(Sri Wulan Megawati, 2020) ⁷	Design: pre-experiment with one-group pre-test-post-test design Sample: purposive sampling with a total of 21 respondents. Variable: Independent: foot exercise, Dependent: Ankle-brachial index Instrument: Spymomanometer, doppler, jelly, alcohol swab, non sterile gloves	The results showed that before being given diabetic foot exercises, a small proportion (14.3%) of the respondents had a normal Ankle Brachial Index value (0.9 -1.4 mmHg). After being given diabetic foot exercise, most (71.4%) respondents had normal value Ankle Brachial Index	Diabetic foot exercise affects the ABI value, this shows that foot exercise can improve leg blood circulation

1	2	3	4	5
		and observation notes to document Analysis: The univariate data analysis used a frequency distribution, while the bivariate used the Paired Sample T-test.	namely (0.9– 1.4 mmHg). Statistical Test Results Paired Sample T-Test with a confidence level of 95% ($\alpha = 0.05$) shows (p-value 0.001), meaning that there is an effect of diabetic foot exercise on the value of Ankle Brachial Index in Type 2 Diabetes Mellitus patients.	
4	(Selpina Embuai, 2019) ⁸	Design: pre-post-test quasi-experimental design with a control group Sample: Consecutive sampling. 94 patients with diabetes mellitus who were assigned to the intervention group (n=47) and the control group (n=47) respectively Variable: Independent: Foot exercise, Dependent: Peripheral status Instrument: 10- g monofilament for the diabetic neuropathy test, a HbA1c test and a sphygmomanometer Analysis: a paired t-test	The results of this study showed there to be significant effects from foot exercise and foot care on the HbA1c test, in relation to the frequency of the dorsalispedis artery and diabetic neuropathy with a significance value of 0.00 ($p < 0.05$). However, in the ankle-brachial index measurement, there were no significant differences between the intervention and control groups with a significance value of 0.26 ($p > 0.05$).	Foot exercise and foot care can be one of the independent nursing interventions used to prevent the complications of diabetes mellitus, as they have been proven to improve the peripheral vascular status of patients with diabetes mellitus by 70-80%
5	(Tintin Sukartini, 2019) ⁹	Design: quasi-experimental pre-post test with control group Sample: amples were 28 respondents using purposive sampling and divided into two groups of 14 respondents each. Variable: The independent variable is diabetic foot training, and the dependent variable is peripheral sensory neuropathy. Instrument: Weinstein Monofilament 10 g Semmes and a diabetic foot training checklist. Analysis: Wilcoxon-signed rank test and Mann Whitney test with $\alpha \leq 0.05$.	The Wilcoxon-signed rank test in the treatment group showed differences in sensory peripheral neuropathy after treatment ($p=0,000$) and no difference in the control group ($p=0.564$). The Mann Whitney test results showed differences in sensory peripheral neuropathy between the treatment group and the control group after treatment $p=0.039$.	Diabetic foot exercises can be used as an alternative measure to improve sensory peripheral neuropathy
6	(Siti Fadlilah, 2019) ¹⁰	Design: quasi-experimental study with pre-test post-test with a control group Sample: An accidental sampling technique was used to select participants, with a total sample of 108 respondents consisting of 36 respondents in a control group, 36 in a sponge , and 36 in a newspaper. Variable: Independent : Foot Exercise, Dependent: Foot sensitivity Instrument: Sponge, newspaper, monofilament Analysis: Wilcoxon and Mann-Whitney test	Among the three groups, only those who received foot exercises using sponges and newspapers had a significant effect on foot sensitivity ($p < .05$). However, there was no significant difference on the effect of foot exercise on foot sensitivity between sponges and newspapers ($p > .05$).	The use of sponges and newspapers in foot exercise could significantly improve foot sensitivity in patients with type 2 diabetes mellitus.
7	(Awinda Sari, 2019) ¹¹	Design: Quasi Experiment pre danpost test two groups Sample: 30 respondents Variable: Independent: allen burger exercise and foot exercise. Dependent :Ankle Brachial Index Instrument: Questioner , Procedure of Burger Allen Exercise, Procedure of foot exercise, vascular doppler ultrasound probe and sphygmomanometer. Analysis: paired sample T-test, $\alpha = 0,05$	The results showed that there was a significant difference in the value of the Ankle Brachial Index (ABI) before and after being given Buerger Allen Exercise and foot exercises, namely $p < 0.05$ with the difference in the average difference in the increase in ABI values in the Buerger Allen Exercise group of 0.0820, while in the leg exercise group, the difference in the average increase in the ABI value was 0.0726.	Buerger Allen exercise is more effective than leg exercises in increasing the value of the Ankle Brachial Index (ABI)

Based on a review of 7 articles that are relevant to the research title described by the researcher in table 1, there are several similarities between one article and another, especially from the results of the study which showed that after doing diabetic foot exercises the risk of neuropathy in diabetes sufferers decreased due to exercise movements. the diabetic foot so that it manages to make the risk of this diabetic neuropathy decrease. Another equation is that the flow of measurements is carried out before and after carrying out diabetic foot exercises because these 7 articles use the same method, namely pre-experiment, one group pre-test and post-test, and which have the same goal of these 7 articles, namely to reduce the risk of neuropathy in The diabetes patient decreases which makes this diabetic patient calm.

DISCUSSION

The results of this literature review found that there were similarities from research articles relevant to the problem and their discussion was based on relevant concepts, or theories. other, especially from the results of research which shows that after doing diabetic foot exercise the risk of neuropathy in diabetic patients decreases due to the movements of the diabetic foot exercise so that it can help patients to improve circulation problems in the blood flow in the legs. Usually, long-standing diabetics tend to have more serious circulation problems due to impaired blood flow through the smaller arteries, this increases susceptibility to sores on the legs that take a long time to heal and the risk of infection. Early detection and adequate treatment can reduce the incidence of infection due to peripheral neuropathy.

Another similarity is that the flow of measurements is carried out before and after carrying out diabetic foot exercises because these 7 articles use the same method, namely pre-experiment, one group pre-test and post-test, and which have the same goal of these 7 articles, namely to reduce the risk of neuropathy in patients diabetes is decreasing which makes these diabetics safe.

CONCLUSION

This study concluded that the 7 articles that are relevant to the research title described by each researcher, there are several similarities between one article and another, especially from the results of the study which showed that after doing diabetic foot exercises the risk of neuropathy in diabetes sufferers decreased due to movement. This diabetic foot exercise movement can help patients to improve circulation problems in the leg blood flow.

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