

## Foot Exercise to Overcome Type 2 Diabetes Mellitus: A literature Review

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### ABSTRACT

Prediction in 2030, the number of deaths due to Diabetes Mellitus (DM) will increase and become the seventh cause of death. The role of patients in managing DM is vital because DM is a chronic disease that will suffer for life. Foot exercise is one type of exercise to apply to DM patients. Diabetic foot exercise improves blood circulation and foot sensitivity. This study aims to inform readers about the effectiveness of foot exercise in overcoming DM type 2. This study is qualitative with a literature review. The analysis used inductive content to identify the main themes in the related literature. This article explores the indexed national and international journals of Scopus, Sinta, and Copernicus. There is an effect of diabetes mellitus foot exercise on improving the quality of life of patients with type 2 diabetes. Foot exercise provides comfort, reduces pain, and nerve damage, controls blood sugar, increases blood circulation in the feet, and improves symptoms of peripheral neuropathy such as tingling and numbness.

**Keywords:** Effectiveness, Foot Exercise, Diabetes mellitus, Type 2 DM



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## 1. INTRODUCTION

In the next ten years, the number of deaths caused by Diabetes Mellitus (DM) is projected to increase by more than 50% and is predicted to become the seventh leading cause of death by 2030 (Peters et al., 2014; Strom & Egede, 2012). Around 4.2 million people die from DM every year in the age range of 20-79 years with complications. One person dies every 8 seconds. Almost half (46.2%) of deaths at the age of 20-79 years are caused by DM. (Coregliano-Ring et al., 2022; International Diabetes Federation, 2019; Linkeviciute-Ulinskiene et al., 2020; Wolde, 2021).

DM disease will impact the quality of life and significantly increase health costs (Akena et al., 2015; Perkeni, 2019). Quality of life is an individual's perception of his position in life in the context of the culture, value system in which they are located, and their relationship to life goals, expectations, standards, and other related matters (Kowitlawkul et al., 2019; Spanemberg et al., 2019). Problems that cover the quality of life are extensive and complex, including physical health, psychological status, level of freedom, social relationships, and the environment in which they are located (Jacob & Sandjaya, 2018). The quality of life of DM patients can be influenced by various factors, namely demographic factors consisting of age and marital status, medical factors including the length of suffering and complications experienced, and psychological factors consisting of anxiety (Raudatussalamah, 2012).

This indicator of the quality of life consists of several sub-indicators, including physical, psychological, social, and environmental health. In the physical health domain, diabetes mellitus patients with diabetic ulcers have the lowest scores. The domain of physical health relates to the patient's feelings

about pain and anxiety that the patient is experiencing, dependence on medical care, energy and fatigue, mobility, sleep and rest, daily activities, and work capacity (Nuari, 2015).

Management of the five pillars can control DM patients to prevent complications and improve quality of life. The management of these five pillars includes diet, pharmacological treatment, physical activity, education (health education), and monitoring of blood sugar levels (Suciana & Arifianto, 2019).

Physical activity is vital in managing DM as a blood sugar controller. It improves cardiovascular risk factors such as reducing hyperinsulinemia, increasing insulin sensitivity, reducing body fat, and lowering blood pressure (Zakiyyah, 2019).

The role of patients and families in managing DM is vital because DM is a chronic disease that will suffer for life. Therefore, it is necessary to educate patients and their families to understand the course of the disease, prevention, complications, and management of DM (Perkeni, 2019). In addition to education, nurses can also teach physical exercises to patients and families for patient independence. One of the physical exercises taught diabetic foot exercise.

Foot exercise is one type of exercise to apply to DM patients. Foot exercise aims to minimize the occurrence of ulcerated infection or tissue damage associated with neurological abnormalities and various degrees of peripheral vascular disease. In the lower extremities and prevent or inhibit and improve peripheral neuropathy in general and in the elderly who already suffer from neuropathy, examination, treatment, and foot exercises should be more intensive. Foot examination and treatment are used for early detection of abnormalities or injuries in the feet, and foot care to maintain or prevent the feet, soles of the feet, and toes. Foot exercises should be done before actual physical exercise or outside of training days and can be done anywhere (Damayanti, 2017).

Diabetic foot exercise improves blood circulation and foot sensitivity (Rusli & Farianingsih, 2015). The effect of diabetic foot exercise on changes in blood sugar levels, namely in actively moving muscles, can increase contraction so that the permeability of cell membranes to increased glucose, insulin resistance decreases, and insulin sensitivity increases (Kafaie, Noorbala, 2012).

Lambrinou et al.'s 2019 study entitled "Lifestyle Factors, Self-Management and Patient Empowerment in Diabetes Care". It states that physical activity and sports, such as diabetic foot exercises, are essential in improving the quality of life of people with diabetes mellitus, preventing complications, and glucose management. It can improve blood glucose control, reduce cardiovascular risk factors, improve well-being, and aid in weight loss. An exercise intervention for at least eight weeks reduced HbA1c levels by 0.66% in people with diabetes, even if there was no weight loss. People with DM should be advised to make the most of their time standing, walking, or doing other light activities (Lambrinou et al., 2019).

This study aimed to analyze the effectiveness of foot exercise in type 2 DM patients in depth. This study's contribution.

## 2. METHOD

This study uses qualitative methods through literature review. The inductive content analysis aims to identify the main themes in the related literature (Hidayat et al., 2022). This article explores the indexed national and international journals of Scopus, Sinta, and Copernicus. Selection of articles through keyword searches and conclusions related to the effectiveness of foot exercises against Type 2 Diabetes Mellitus.

## 3. RESULTS AND DISCUSSION

### 3.1 Type 2 Diabetes Mellitus

Diabetes mellitus is a progressive chronic disease (Bastani & Beigi Boroujeni, 2019; Nuniek Tri Wahyuni et al., 2022; Wang et al., 2022). The characteristics of DM are that the body cannot metabolize carbohydrates, proteins, and fats or high blood sugar levels (Aslam et al., 2019; Black, J. M., & Hawks, 2014; Febrinasari et al., 2020; Halim & Halim, 2019). Diabetes mellitus is a chronic blood sugar metabolism disorder characterized by high blood sugar levels caused by impaired insulin secretion, insulin resistance, or both (Castaño et al., 2019; Evi & Yanita, 2016; Jwad & AL-Fatlawi, 2022; Lufthiani, 2020; Rachdaoui, 2020). Insulin disorders in the body need gradual therapy to overcome (Bridges et al., 2018; Perkeni, 2019). Diabetes mellitus requires continuous medical treatment and self-care education for patients (Azar et al., 2018).

Diabetes mellitus is caused by the function of the pancreas not producing enough insulin or the body cannot use insulin effectively (Dewi, 2019; Malone & Hansen, 2019; Zheng et al., 2019). The causes of diabetes mellitus are divided into two; the first occurs because there is a decrease in insulin sensitivity (insulin resistance) (Budiana Yazid, Vitri Rokhima, Heni Triana, 2021; Jwad & AL-Fatlawi, 2022). Type 2 diabetes mellitus is influenced by environmental factors such as obesity, an unhealthy lifestyle, and a high-carbohydrate diet (Maria, 2021)

### 3.2 Foot Exercise

Foot exercise is an activity or exercise that is done to prevent injuries and help improve blood circulation in the legs. Foot exercise can be done regularly in a standing, sitting, and sleeping position every day by moving the legs and leg joints. The nurse's role is as a guide for clients to do foot exercises independently; doing foot exercises can cause the restoration of peripheral nerve function by inhibiting Aldose Reductase (RA), which increases NADPH (Nicotinamide Adenine Dinucleotide Phosphate Hydroxide). Increased NADPH can increase the synthesis of Nitric Oxide (NO), where NO can eliminate hypoxia in peripheral nerves and restore nerve function in clients with peripheral neuropathy (Abdurrasyid et al., 2020).

Physical exercise is one of the principles in the management of diabetes mellitus. Daily physical activity and regular physical exercise (3-4 times a week for approximately 30 minutes) are the pillars of diabetes management. Physical exercise in question is walking, leisurely cycling, jogging, gymnastics, and swimming. Physical exercise should be adjusted to age and physical fitness status (Priyanto & Sahar, 2013).

There are six goals for foot exercises (Widiawati et al., 2020), namely: 1) Increase/improve blood circulation; 2) Strengthens small muscles; 3) Prevent foot deformities; 4) Increases calf and thigh muscle strength; 5) Overcome the limitation of joint motion; 6) Improve the fitness of clients with diabetes mellitus.

The steps for implementing foot exercises are as follows:

***Sit up straight on a bench or chair (without leaning back); both feet touch the floor and take off footwear.***

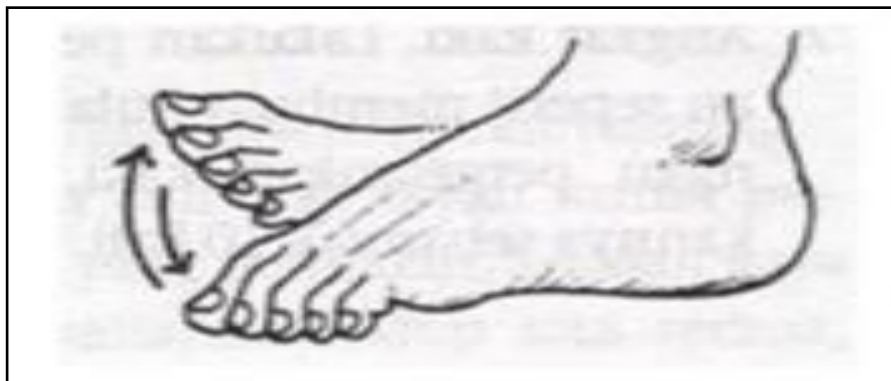


**Figure 1.** Diabetic Foot Gymnastics Position

Source: Damayanti (2017)

#### ***Exercise 1***

With heels on the floor, move toes like claws and straighten them back ten times.



**Figure 2.** Chicken claw movement

Source: Damayanti (2017) & Handayani (2018)

**Exercise 2**

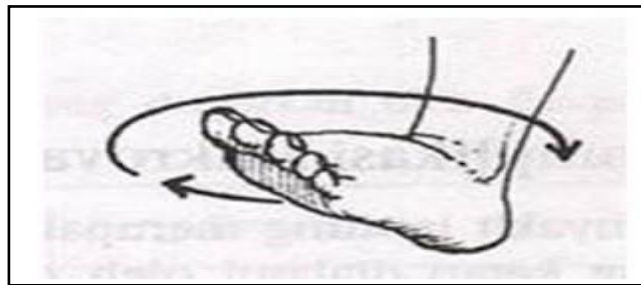
Lift toes, and keep heels on the floor. Lower the toe, then lift the heel and lower it back down (repeated ten times).



**Figure 3.** Heel and foot lift movement  
Source: Damayanti (2017) & Handayani (2018)

**Exercise 3**

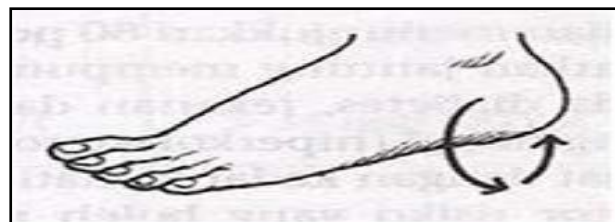
Lift both legs. Turn the foot at the ankle to the side. Lower back to the floor and move to the center.



**Figure 4.** Circular motion of the ankle  
Source: Damayanti (2017) & Handayani (2018)

**Exercise 4**

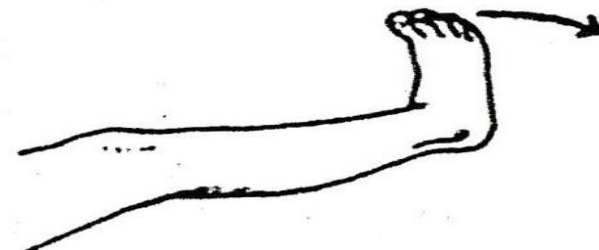
Lift both heels. Turn both heels to the side. Lower back to the floor and move to the center.



**Figure 5.** Move the heel lift  
Source: Damayanti (2017) & Handayani (2018)

**Exercise 5**

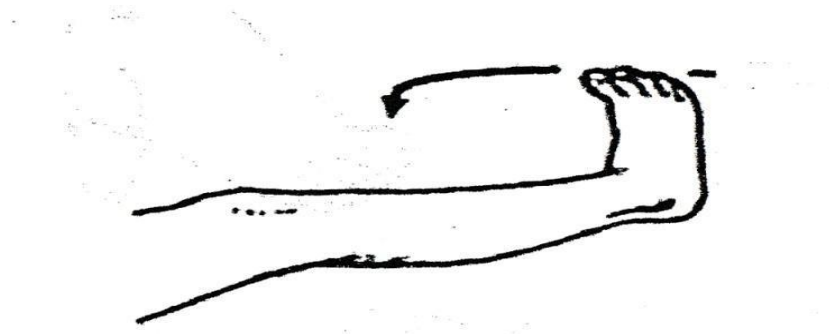
Lift one knee and straighten the leg. Move toes forward. Lower leg back alternately left and right.



**Figure 6.** Move one knee lift  
Source: Damayanti (2017)

**Exercise 6**

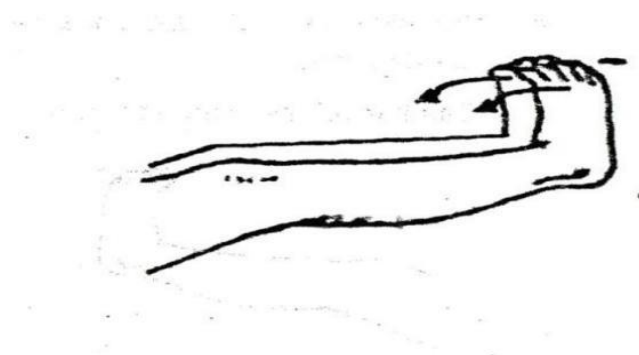
Straighten one leg on the floor. Then lift the leg. Move your fingertips toward your face. Lower your heels back to the floor.



**Figure 7.** Move one leg up  
Source: Damayanti (2017)

**Exercise 7**

Like the previous exercise but this time with both legs together.



**Figure 8.** Move both legs up  
Source: Damayanti (2017)

**Exercise 8**

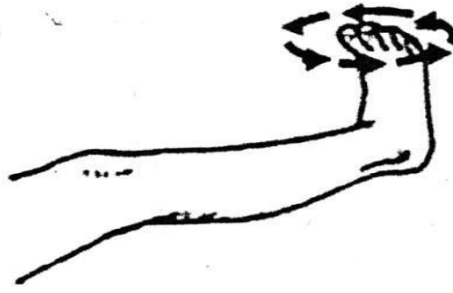
Lift legs straight and maintain this position. Rotate the foot at the ankle outward. Lower both feet back to the floor.



**Figure 9.** Lifting movement of both legs straightened and maintained  
Source: Damayanti (2017)

**Exercise 9**

Lifting movement of both legs straightened and maintained. Straighten one of the legs and lift it straight. Rotate the foot at the ankle. Write in the air with feet the numbers 0-9.



**Figure 10.** Movement straightens one leg and lifts straight.

Source: (Damayanti, 2017)

**Exercise 10**

Put the newspaper on the floor and open it. Tear into two parts. One part is torn as small as possible using the toes. Collect the small pieces of newspaper in a large torn, fold them up, and throw them in the trash.



**Figure 11.** Move to tear the newsprint using your feet

### 3.3 The Effectiveness of Foot Exercise to Overcome Type 2 Diabetes Mellitus

Self-management behavior is an important component of DM knowledge (Al-Khawaldeh et al., 2012). Good knowledge of foot exercises can shape behavior to self-medicate DM treatment (Smith-Tran, 2018). Nuraeni & Arjita's (2019) article states that leg exercises can effectively help control blood sugar levels other than taking medication or dieting to reduce complications due to poor blood circulation, such as long-healing wounds that lead to gangrene. Widia & Hidayat's (2021) research literature review shows that publications in the last ten years have shown that foot exercises effectively reduce the risk of neuropathy in patients with type 2 diabetes.

## 4. CONCLUSION

There is an effect of diabetes mellitus foot exercise on improving the quality of life of patients with type 2 diabetes. Foot exercise provides comfort, reduces pain, and nerve damage, controls blood sugar, increases blood circulation in the feet, and improves symptoms of peripheral neuropathy such as tingling and numbness.

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