

Buerger Allen Combination Therapy Exercises and Soak Feet Warm Water Lowers Blood Sugar Levels in Elderly with Diabetes Mellitus Type 2

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Article Info:

Submitted:
04-08-2021
Revised:
25-05-2022
Accepted:
26-05-2022

DOI:
<https://doi.org/10.53713/nhs.v2i2.32>



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ABSTRACT

Management of type 2 diabetes mellitus was needed to overcome increasing blood glucose levels in the elderly with diabetes mellitus. In addition to pharmacology, there was non-pharmacology as a complementary therapy in reducing blood glucose levels. This study analyzes the effectiveness of combined Buerger Allen exercise therapy and feet immersion with warm water for blood glucose levels in the elderly with type 2 diabetes mellitus. The intervention was held 12 times in 15 days with a training schedule three times per week and every day twice at 08.00 WIB and 16.00 WIB with a duration of 16 minutes per meeting. The results of paired T-test were obtained with a p-value is 0,000, indicated there were significant differences in blood glucose levels between before and after therapy. The elderly should go on a Diabetes Mellitus diet, adequate rest, and exercise with combination therapy of burger Allen & soaking the feet in warm water.

Keywords: blood glucose levels; Buerger Allen exercise; feet immersion with warm water

INTRODUCTION

Globally, the elderly population is expected to continue to increase, and from 2015 the era of an aging population has begun because the number of older people exceeds the figure of 7 percent. Based on population projection data in 2017, the elderly population in Indonesia reached 23.66 million people (9.03%). Of all regions in Indonesia, the most extensive prevalence of older adults is in the city of Yogyakarta, with a percentage of 13.81% (Kemenkes RI, 2017).

The IDF (International Diabetes Federation) said the world incidence of diabetes mellitus in 2015 reached 415 million people, and by 2040 that number is predicted to increase sharply. The prevalence of diabetes mellitus in Southeast Asia is 87 million people. The prevalence of diabetes mellitus in Indonesia in 2015 amounted to 10 million people (IDF, 2015). Primary health research results (Risksedas, 2018) showed the incidence of diabetes mellitus in Indonesia based on doctor's diagnosis by 2.0%, while by region showed the highest incidence rate was in DKI Jakarta at 3.4%, North Sumatra at 2.0%, and West Java at 1.7% of older adults diagnosed with diabetes mellitus.

The elderly are the final stage of the aging process. Aging is a complete change in living things characterized by a decrease in bodily functions. In humans, aging is a degenerative change in cells, tissues, and other organs (Kholifah et al., 2016; Budiman et al., 2021). The elderly also find it difficult to maintain body homeostasis. Disruption to homeostasis causes malfunction of various organ systems and is easily susceptible to various diseases. One of the disturbed homeostasis is the management system of blood sugar level (Kurniawan, 2010).

Disruption of the blood sugar regulatory system results in a more than usual increase in blood sugar. Blood sugar increases with age. During the aging process, more older adults are at risk of diabetes mellitus (Kurniawan, 2010). Diabetes mellitus in the elderly is often unnoticed due to the natural decrease of physical changes. So diabetes mellitus that is not detected early can cause chronic complications (Amrina & Indang, 2013; Nistiandani et al., 2021).

Management of diabetes mellitus can be done by pharmacological and non-pharmacological. Pharmacological management is carried out by taking medication. Generally, the standard drug taken by people with diabetes mellitus is metformin. In addition, there is non-pharmacological management as a complementary therapy to lower blood sugar levels. One of the complementary therapies proven in several studies that can lower blood sugar levels is Buerger Allen exercise therapy and soak feet of warm water (Kurdi et al., 2021).

Buerger Allen exercise is an active motion exercise in the plantar area with a gravitational force. Every movement on this exercise should be done regularly (Chang & Chen, 2015). Buerger Allen exercises can accelerate vascularity so

that the circulation of sugar in the blood goes well (Salindeho et al., 2016). Soaking feet of warm water is one way of foot care that can be done (Kozier et al., 2010). Soaking feet in warm water can reduce pain, tingling, and cramping. Heat will improve circulation, improve nutrient circulation, disposal of residual substances and reduce mild congestion in injured tissues in the area (Barbara, 2010).

Warm foot soak therapy gives rise to muscle relaxation and vasodilation so that blood carrying oxygen and sugar will quickly reach the tissues (Chaitow, 2016). Based on preliminary studies conducted by surveys and examining blood sugar levels, older adults' treatment with type 2 diabetes mellitus is common control and taking medication. They do not apply DM diet patterns and exercise activities. Families with type 2 diabetes mellitus also have no full support for improved elderly health status. So the treatment can still not overcome the health problems experienced by older adults with type 2 diabetes mellitus. Therefore, researchers conducted a study on the effectiveness of Buerger Allen combination exercises and soaked feet of warm water in lowering blood sugar levels in elderly type 2 diabetes mellitus.

METHOD

This research is quasi-experiment research using pre and post-test without control group design. The sampling technique uses consecutive sampling with a sample count of 16 clients calculated through the Federer formula. Innovation intervention of combination therapy Buerger Allen exercise and soak feet of warm water is done as many as 12 times in the space of 15 days. The schedule of practices every week three times and every day has done twice at 08.00 WIB and 16.00 WIB with 16 minutes each meeting. This combination therapy starts from Buerger Allen exercise therapy for 6 minutes, lifting the legs at a 45° angle, performing ankle movements, and lying down with a blanket. Soak the feet in warm water done for 10 minutes.

Blood sugar level examination before and after intervention of combination therapy Buerger Allen exercise and soak feet of warm water. The meeting was held at the client's home visit in Grogol Village, Depok, for two weeks in February 2020. The research instrument uses SOP combination therapy Buerger Allen exercise and Soak feet of warm water, assessment sheet of blood sugar levels, blood sugar check tool. Data analysis uses a dependent T-test due to normally distributed data (Hastono, 2016). Research Ethics in this study was conducted to protect respondents as research subjects.

RESULT

Analysis of The Development of Blood Sugar Levels

Table 1. Analysis of The Development of Blood Sugar Levels (n=16)

Client	Age (Year)	Blood Sugar Levels (mg/dl)			
		Day 0 (Pre-test)	Day 5	Day 10	Day 15 (Post-test)
1	68	382	224	189	118
2	67	500	332	256	173
3	60	309	280	200	174
4	70	382	303	247	185
5	60	287	189	156	123
6	77	448	367	158	160
7	69	429	289	177	163
8	75	441	376	218	157
9	60	399	234	176	183
10	64	337	323	169	197
11	75	546	343	257	116
12	66	255	201	187	127
13	65	294	183	146	126
14	60	289	203	195	119
15	71	254	182	161	150
16	68	374	227	165	148

Table 1 shows an analysis of the development of blood sugar levels as they decreased as therapy was performed on 16 clients from before the intervention, day 5, day 10, and day 15 after the intervention.

Distribution of Average Blood Sugar Levels Before, During, and After Exercise Combination Therapy Buerger Allen Exercise and Soak Feet Warm Water

Table 2. Distribution of Average Blood Sugar Levels Before, During, and After Exercise Combination Therapy Buerger Allen Exercise and Soak Feet Warm Water

Variable	n	Mean	SD	Min	Max
Day 0 (Pre-test)	16	370.38	87.309	254	546
Day 5	16	266.00	68.462	182	376
Day 10	16	191.06	35.947	146	257
Day 15 (Post-test)	16	151.19	26.960	116	197

Table 2 shows the average (mean) blood sugar level before therapy at 370.38 mg/dl. Then after five days of treatment of 266 mg/dl, then the 10th day after therapy administration of 191.06 mg/dl, and on the 15th day after therapy of 151.19.

Effectiveness of Combination Therapy Buerger Allen Exercise and Soak Feet Warm Water in Lowering Blood Sugar Levels in Elderly Diabetes Mellitus Type 2

Table 3. Blood Sugar Levels Before and After Buerger Allen Exercise Combination Therapy Exercises and Soak Feet of Warm Water (n=16)

Variable	n	Mean	Std. Deviation	p-value
Pre-Blood Sugar Levels	16	370.38	87.309	0.000
Post-Blood Sugar Levels	16	151.19	26.960	

Table 3 shows that Buerger Allen exercise combination therapy exercises and soaking feet of warm water can lower blood sugar levels by 219.19 mg/dl, i.e., from 370.38 (before intervention) to 151.19 mg/dl (after intervention). The dependent T-test obtained p-value = 0.000 means statistically significant differences in blood sugar levels between before and after the combination therapy Buerger Allen exercise and soak feet of warm water. So this exercise is effective in lowering blood sugar levels in older adults with type 2 diabetes mellitus.

DISCUSSION

Elderly is a time when a person is old or more than 60 years old. At this time, the body is aging, one of which is the body's metabolic process. Metabolic processes occur when the hormone insulin is associated with receptor membranes so that the permeability of cell membranes increases and cells can absorb glucose. In cells, the hormone insulin cooperates with enzymes for the body's metabolic processes. In the aging process, the production of enzymes that help metabolism begins to be impaired. It is unable to cooperate with insulin and causes glucose levels not to be circulated into cells. This condition causes high blood sugar levels or hyperglycemia (Copstead & Banasik, 2010). In line with Sopriana's (2011) research, as many as 29.3% of seniors aged 60-69 years and 20.8% of seniors aged ≥ 70 years suffer from type 2 diabetes mellitus.

Diet also affects the increase in blood sugar levels. Excessive sugar intake can cause blood sugar levels to increase. Control of type 2 diabetes mellitus is done by limiting the eating of white rice, increasing the consumption of vegetables & fruits, and limiting drinking coffee and other sugary drinks. If consumed excessively, it will increase sugar production in the blood and cause high blood sugar levels or hyperglycemia (Ratnawati, 2013). In addition to diet, physical exercise helps the process of setting blood sugar levels. Cell membranes against glucose become permeable due to muscle contraction. At the time of activity, insulin resistance is reduced. Physical exercise is helpful as a blood sugar regulator and prevents obesity in type 2 diabetes mellitus (Ilyas J, 2013).

Combination therapy Buerger Allen exercises and soak feet of warm water, including foot exercises, can overcome type 2 diabetes mellitus (Awinda et al., 2019). Blood sugar level examination is done pre and post-test therapy administration. The decrease in blood sugar levels in elderly type 2 diabetes mellitus occurs because Buerger Allen exercise is a leg exercise that applies changes in gravitational force to the position implemented. This exercise involves a muscle pump that includes dorsoflexion and plantarflexion through the active movement of the ankle. The muscle pump can stimulate the endothelial to release nitrite oxide so that the smooth vascular muscles relax. At the time of muscle relaxation, vasodilation and blood flow occur smoothly (Purnawarman & Nurkhalis, 2014). In addition, soaking

feet of warm water is also equally beneficial. Soaking feet of warm water is a process of heat delivery that can increase blood flow and accelerate the spread of nutrients into tissues (Barbara, 2010).

Table 1 shows an analysis of the development of significant blood sugar levels over 15 days. Sixteen clients experienced decreased blood sugar levels while being below the standard value limit (GDS < 200 mg/dl). Table 2 shows the average (mean) blood sugar levels that decreased with therapy. Before the therapeutic intervention begins, the client has carried out a blood sugar level check at a time. The average (mean) blood sugar level before therapy is 370,375, indicating high blood sugar levels. The further intervention was carried out during the first five days. The average value of blood sugar levels on the 5th day after administering therapy was 266,000, which indicates that blood sugar levels are still high.

Evaluation obtained by all clients experienced decreased blood sugar levels, but still not at the limit of expected values. The intervention was again carried out on the second 5 days, and on the 10th day, a blood sugar level test was performed. Then the average value of blood sugar levels on the 10th day after administering therapy is 191,062, indicating blood sugar levels within normal but risky limits. The intervention was carried out again on the third five days, and on the 15th day, a blood sugar level test was performed. The last average value of blood sugar levels on the 15th day after administering therapy was 151,188, indicating blood sugar levels were within normal limits. Evaluation obtained all clients experienced a decrease in good blood sugar levels. This can be seen from the client's blood sugar levels which all reach average values.

Table 3 showed the results of the dependent T-test obtained p-value = 0.000, meaning that Buerger Allen exercise combination therapy exercises and soak feet of warm water effectively lower blood sugar levels in older adults with type 2 diabetes mellitus. This is in line with research conducted by Supriyadi (2019), which revealed that the p-value of blood sugar levels 0.001 (p-value < 0.05) indicates a statistically meaningful change in the value of blood sugar levels during the after-intervention. This study is also in line with research (Sahena, 2018) which is soaking feet of warm water effectively facilitates blood flow. In addition, in line with research conducted (Fian et al., 2017), soaking feet of warm water affects peripheral blood circulation in diabetic Mellitus patients.

In addition, this study does not correspond to research conducted by Eversden (2008) that soaking feet of warm water is done at a temperature of 38-39 °C using a water thermometer. In this study, generous water temperature measurements did not use a water thermometer and only felt the water temperature based on the hand sensory system. Preferably, the temperature is determined so that the effect is more targeted.

All clients in this study were female. Most clients have had type 2 diabetes mellitus for ten years. Most clients say they have never received health education related to diabetes mellitus. The whole client never says diet according to DM diet. Almost all clients never exercise. All these characteristics influence the effectiveness of the intervention given. The therapeutic interventions provided present different gaps. This intervention does not start on the same date between all clients. Interventions are carried out under the respondents encountered until the number of samples is met. The duration of the intervention time remains in theory for 15 days.

Implementing therapeutic innovation interventions still requires family support in DM diet pattern planning, scheduled physical activity exercises, and regular medication control. Family conditions with 16 clients vary. Some support the elderly to implement healthy living, and others do not keep it. A real example occurs in the sixth, ninth, and tenth clients (can be seen in Table 1). Between day ten and day 15, the three clients did not follow the DM diet. One of the three even drank coffee. This happens because the client cannot control his desire to consume sugary foods and drinks. In addition, the family of one of the clients is less supportive in setting the client's diet. This condition can inhibit the desired therapeutic effect.

Elderly type 2 diabetes mellitus who diligently conduct therapy according to SOP at the scheduled time and the presence of family support can affect the effectiveness of therapeutic interventions. Exercise should be done continuously and repeatedly to improve blood flow circulation. It is associated with vasodilation and increased capillary permeability to easily absorb glucose (Jemcy & Rathiga, 2015); (Rosales-Velderrain et al., 2013). This exercise accelerates insulin production to be used to transport glucose to cells so that the blood sugar of diabetes mellitus patients decreases (Chang & Chen, 2015). Support from the family can be in the form of dietary arrangements for elderly clients with diabetes mellitus, reminding the schedule of therapy exercises, and participating in therapy with clients.

The role of community nurses is to be a source of health information and educate about health efforts that can be done. Community nurses provide nursing care services on the problem of diabetes mellitus as well as counselors who are trusted to provide solutions to problems and develop constructive coping. Community nurses are also reformers by providing health education and demonstrating complementary therapy innovations in the combination of Buerger Allen exercise therapy and warm water foot soak, which is the therapy of choice in lowering blood sugar levels.

CONCLUSION

The results found that Buerger Allen exercise combination therapy exercises and soaking feet of warm water can lower blood sugar levels. The success of this intervention also involves supporting factors such as regular control to health facilities, taking medication, regulating the diet of diabetes mellitus, performing physical activity, and family support.

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