

Application of the Buerger Allen Exercise (BAE) in Lowering Blood Glucose Levels in Mrs. S With Diabetes Mellitus in Sukoanyar Village, Pakis District, Malang Regency

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Abstract: Diabetes mellitus is a metabolic disorder characterized by persistent hyperglycemia caused by impaired insulin secretion, ineffective insulin action, or both. In addition to pharmacological treatment, supportive non-pharmacological interventions are needed to help control blood glucose levels, especially in patients with circulation problems. **Objective:** This study aimed to determine the effect of Buerger Allen Exercise (BAE) therapy on reducing blood glucose levels in a patient with diabetes mellitus in Sukoanyar Village, Pakis District, Malang Regency. **Method:** This study used a qualitative approach with a case study design. Data were collected on May 3–8, 2025. The subject was selected using purposive sampling. Buerger Allen Exercise therapy was administered for 15 minutes over six consecutive days based on the standard operating procedure, and blood glucose levels were measured after each session. **Findings:** The results showed that the implementation of Buerger Allen Exercise therapy contributed to a reduction in blood glucose levels in the patient with diabetes mellitus. **Implications:** These findings indicate that Buerger Allen Exercise may be used as a supportive non-pharmacological intervention in diabetes management, particularly in community-based nursing practice. **Originality:** The originality of this study lies in the application of Buerger Allen Exercise as a simple, low-cost, and practical nursing intervention in a real community setting.

Keywords: Buerger Allen Exercise, BAE, Blood Glucose, Diabetes Mellitus

INTRODUCTION

Diabetes mellitus has now entered the era of globalization, becoming one of the world's health problems (Mataputun, 2020). Diabetes mellitus is a chronic disease characterized by metabolic disorders marked by high blood glucose levels exceeding normal limits, caused by a lack of insulin, the inability of insulin to work optimally, or both (Mataputun, 2020; Wijayanti & Warsono, 2022). Insulin itself is a type of hormone produced by the pancreas that functions to transport blood glucose into cells. Therefore, if there is a situation where the amount of insulin is insufficient or completely absent, it can cause an increase in blood glucose levels (Dewi, 2021).

Diabetes mellitus is a form of carbohydrate, protein, and fat metabolism disorder characterized by high blood glucose levels (hyperglycemia). Chronic hyperglycemia, or high blood glucose levels over a long period of time, can cause damage, dysfunction, and

even failure of various organs in the body, such as the eyes, nerves, kidneys, heart, and blood vessels. It is this state of hyperglycemia that has a detrimental effect on various organs of the body, such as diabetic neuropathy, diabetic foot ulcers, diabetic retinopathy, even diabetic nephropathy, or disorders of the blood vessels (Dewi, 2021). Additionally, severe hyperglycemia can cause several symptoms such as polyuria, polydipsia, polyphagia, weight loss, decreased performance and fatigue, and susceptibility to ketoacidosis or nonketoacidosis infections (Widiasari, 2021).

Diabetes mellitus is one of the global problems whose prevalence continues to increase from year to year, both globally and in Indonesia (Rahmi & Rasyid, 2023). The prevalence of diabetes tends to be higher in low- to middle-income countries than in high-income countries (Kaffah, 2024). Globally, about half of the total population suffers from undiagnosed diabetes, with approximately 5 million deaths among people aged 20 to 99 years (Budiman, 2020). The International Diabetes Federation (IDF) has reported that 537 million adults aged 20-79 years worldwide have diabetes mellitus. This number is expected to continue to increase between 2030 and 2045, with an estimated 643 to 783 million people suffering from diabetes mellitus (Sun, 2022). In 2018, Riskesdas reported the prevalence of diabetes mellitus in Indonesia to be 713,783 people over the age of 15 (Riskesdas, 2018).

The high incidence of diabetes mellitus can be caused by several factors, including genetic disorders acquired in the womb, age, unhealthy lifestyles, obesity, stress, diseases or infections of the pancreas that prevent it from producing insulin optimally, and consumption of drugs that can damage the pancreas (Sari, 2022). In general, diabetes can occur due to an unhealthy lifestyle, which can cause glucose to accumulate in the blood. If this reaches normal levels and persists for a long time or becomes chronic, it can cause severe complications, preventing sufferers from being able to carry out normal activities.

Regarding the issue of hyperglycemia in patients with diabetes mellitus, there are several ways to manage it, either through pharmacotherapy with medication to lower blood glucose levels and insulin administration, or through non-pharmacotherapy management which can include education, diet management, physical activity, nutrition, diabetic foot exercises, and Buerger Allen exercises (Nurjanah, 2024). Regularly performing Buerger Allen exercises is one method that can be used for diabetic patients with circulatory or arterial issues. This exercise can help the body's need for oxygen and nutrients to enter the arteries and veins, strengthen and maximize the work of small muscles, improve

circulation, increase the production of insulin hormones used to transport blood glucose to cells, and prevent foot deformities (Afida, 2022).

Based on preliminary studies in Cokro Hamlet, Sukoanyar Village, Pakis Subdistrict, most diabetes mellitus patients only drink herbal remedies such as boiled red betel leaf and mengkudu juice and follow a low-sugar diet. Some people take medication and use insulin regularly, but none have used the Buerger Allen Exercise to lower their blood glucose levels. Therefore, the researcher is interested in conducting a study on “The Application of Buerger Allen Exercise in Lowering Blood Glucose Levels in Mrs. S with Diabetes Mellitus in Sukoanyar Village, Pakis Subdistrict, Malang Regency.”

RESEARCH METHOD

This study uses a qualitative research design with a case study research strategy. Case study research, commonly referred to as case studies, is a research method that involves the intensive, comprehensive, and in-depth study of a single unit (client, family, group, community, or institution) to obtain detailed and clear findings and descriptions of a particular unit of society (Handriani, 2024). The researcher used a qualitative descriptive analysis method to focus on descriptive data processing, which aims to solve problems without changing the actual research variable data. As a result of observation, interviews, and documentation, researchers collect data to find answers to the problems being studied. Then, these answers are communicated through writing, which can be read by others (Adlini, 2022).

The sampling method is known as sampling technique, where in this study the researcher used non-probability sampling technique with purposive sampling method. Purposive sampling is a non-random sampling method in which the researcher ensures the selection of illustrations by using a method of determining special identities that match the research objectives so that they can respond to the research case (Lenaini, 2021). The sample size in this study was 1 respondent. The sample in this study was diabetes mellitus patients who did not undergo regular check-ups and were not taking regular medication.

The inclusion criteria for this study are: 1) Patients with a medical diagnosis of diabetes mellitus; 2) Not currently taking certain medications; 3) Patients aged between 21 and 75 years; 4) Patients who can communicate well. The exclusion criteria are: 1) Diabetes mellitus patients who regularly undergo check-ups and take medication; 2) Diabetes mellitus patients with diabetic foot ulcer complications. Before conducting this study, the

researchers prepared a letter of consent to participate as a respondent and gave it to patients who met the inclusion criteria as informed consent. If the patient agreed and signed the letter, the study could proceed.

The instruments in this study were tailored to the objectives and research subjects, as the data obtained would then be analyzed comprehensively. The instrument used in this study was the Buerger Allen exercise therapy SOP. In addition, the effectiveness of Buerger Allen exercise therapy in lowering blood glucose levels was evaluated by checking blood glucose levels after 6 consecutive days of therapy. The procedure for implementing Buerger Allen exercise therapy is as follows:

1. In the first step, the lower extremities are raised to an angle of 45-90 degrees and supported in the same position for 3-5 minutes until the skin becomes pale and there is a tingling sensation.

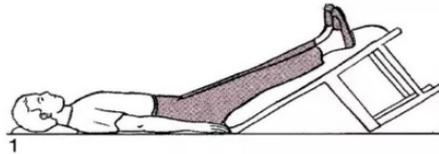


Figure 1. Patient Position in the First Stage of Therapy

2. In the second step, the patient is asked to sit in a relaxed position with their feet and legs resting below the level of the rest of their body and perform individual flexion/extension of the feet, followed by pronation/supination movements for 2-5 minutes until redness appears.



Figure 2. Patient Position in the Second Stage of Therapy

3. The third step is the horizontal position, where the patient is asked to lie quietly for 5 minutes with both feet resting on the bed.

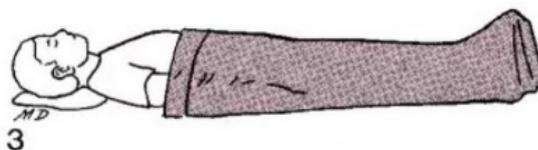


Figure 3. Patient Position in the Final Stage of Therapy

RESULT

Table 1. Demographic Data and Medical History

No.	Variable	Results
1.	Name	Mrs. S
2.	Age	65
3.	Gender	Female
4.	Occupation	Housewife
5.	Marital Status	Widow
6.	Weight	39 kg
7.	Height	143 cm
8.	Duration of DM	± 13 years
9.	History of Previous Illness	No history of specific illness
10.	Family History of Illness	Heart attack
11.	Treatment History	Uncontrolled
12.	Activity Pattern	No strenuous activity
13.	Diet Pattern	Uncontrolled
14.	Blood Glucose Level	High (Not detected)

Table 1 shows that the respondent is 65 years old, female, with a primary school education, and is a housewife who is widowed because her husband died a few weeks ago. The respondent lives with her children, son-in-law, and two grandchildren. The respondent stated that she had been suffering from diabetes mellitus for approximately 13 years and did not undergo regular check-ups or treatment. The patient did not engage in strenuous activities, but her daily diet and lifestyle were not controlled. The blood sugar test result at the time of the initial assessment was high or undetectable because it was too high.

Table 2. Blood Glucose Measurement Results During 6 Days of Therapy

Day	Results
Day 1	High (Not detected)
Day 2	High (Not detected)
Day 3	546 mg/dL
Day 4	515 mg/dL
Day 5	477 mg/dL
Day 6	413 mg/dL

Table 2 shows a significant change in the blood glucose levels of respondents from the first day to the sixth day of the Buerger Allen exercise intervention. On the first and second days, the results of the blood glucose test were still undetectable, as they were still too high, but on the third day of the intervention, the respondents' blood glucose levels were at 546 mg/dL. After six consecutive days of intervention, blood glucose levels continued to decline, reaching 413 mg/dL. The client also reported that during the six consecutive days of implementation, the numbness in their extremities gradually improved.

This was also accompanied by an improvement in daily eating habits, with a reduction in sugar and sweet drink consumption.

DISCUSSION

Humans generally experience drastic physiological changes after the age of 40. Diabetes mellitus often appears when a person reaches this age, especially after the age of 45. This is due to physiological changes that cause the body to become less sensitive to insulin (Ibrahim, 2021). Women have a higher risk of developing diabetes mellitus because they have a component that is resistant to insulin, which increases when a person is pregnant. This resistance occurs because women tend to have poor habits of not exercising enough and not maintaining a healthy diet (Mataputun, 2020).

Based on the results of the study, it was found that before the Buerger Allen exercise intervention, the blood glucose levels of the respondents were undetectable because they were too high. After performing the Buerger Allen exercise once a day for 6 consecutive days with a duration of 15 minutes per exercise, there was a significant decrease in blood glucose levels in the research respondents. This is in line with the study (Hasina, 2022), which states that regular Buerger Allen exercise helps improve arterial and venous blood flow by relaxing the vascular muscles, and this movement can increase blood vessel vascularization, which will increase blood supply in the tissues, thereby lowering blood glucose levels.

Several studies have indicated that the Buerger Allen exercise is effective in lowering blood glucose levels, as its movements cause muscle pumping and utilize gravity on the legs, which can effectively increase perfusion in the extremities (Wijayanti & Warsono, 2022). The Buerger Allen exercise can relax the muscles in the legs, cause the muscles to contract, and stimulate the release of nitric oxide in the blood vessels, as well as increase blood vessel flexibility, which ultimately optimizes blood circulation in carrying oxygen and nutrients to the pancreas to produce maximum insulin, thereby controlling blood glucose levels (Marlena & Podesta, 2023).

In a study conducted by the author, the application of the Buerger Allen exercise for 15 minutes on six consecutive days was effective in lowering blood glucose levels in patients with diabetes mellitus. In addition, improving unhealthy lifestyle patterns also has a significant effect on lowering blood glucose levels. Therefore, the author states that the decrease in blood glucose levels in respondents who underwent the intervention for six

consecutive days was not only due to the Buerger Allen exercise, but also balanced by improvements in daily lifestyle patterns, such as reducing sugar consumption and sweet drinks.

CONCLUSION

This case study highlights that the structured implementation of the Buerger Allen Exercise (BAE) for approximately 15 minutes daily over six consecutive days was followed by a consistent reduction in the client's blood glucose readings, shifting from an initial "high/not detected" level to 413 mg/dL on day six, alongside a reported improvement in extremity numbness and healthier dietary behavior. The main lesson from this case is that a simple, low-cost, and home-based exercise routine may support glycemic control efforts when applied consistently and accompanied by basic lifestyle adjustments.

The scientific contribution of this study lies in providing a detailed, practice-oriented description of BAE implementation in a community setting for an older adult with long-standing uncontrolled diabetes who was not engaged in regular clinical treatment. By documenting day-to-day glucose trends during the intervention period and noting concurrent symptom changes, this report adds contextual clinical evidence that may inform community nursing practice and serve as a basis for developing structured non-pharmacological self-management programs for individuals with diabetes mellitus.

Nevertheless, this study has several limitations. The findings are based on a single respondent and a short observation period, without a comparison group, which limits causal interpretation and generalizability. In addition, changes in diet and other daily behaviors occurred during the same period and were not controlled, and the baseline glucose value was recorded as "high/not detected," which depends on the measurement range of the device used. Future studies are recommended to include larger samples, standardized measurement timing and instruments, controlled monitoring of confounding factors (diet, medication, activity), and longer follow-up to evaluate the independent and sustained effects of BAE on glycemic outcomes.

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