Nurse Update

The Impact of Progressive Muscle Relaxation Therapy on Reducing Blood Glucose Levels in Type 2 Diabetes Mellitus Patients

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Abstract

Background: Diabetes mellitus is a metabolic disorder characterized by increased blood glucose levels (hyperglycemia) due to abnormalities in insulin secretion, insulin action, or both. Progressive muscle relaxation therapy is an alternative method for reducing muscle tension in type 2 diabetes mellitus patients.
Objective: To determine the effect of progressive muscle relaxation therapy on reducing blood glucose levels in type 2 diabetes mellitus patients.
Methods: This quantitative research used a pre-experimental design with a one-group pretest and post-test approach. The sample consisted of 17 respondents selected through purposive sampling. Data were analyzed using a paired t-test.
Results: The average blood glucose level before the intervention was 258.00 mg/dL, while after the intervention, it was reduced to 249.00 mg/dL. Statistical analysis showed a significant effect ($p = 0.009$, $p < 0.05$).
Conclusion: Progressive muscle relaxation therapy effectively reduces blood glucose levels in type 2 diabetes mellitus patients. It is recommended that patients adopt this therapy as part of their diabetes management routine.

Keywords:
Diabetes Mellitus; Progressive Muscle Relaxation (PMR) Therapy; Blood Glucose Levels

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Introduction

Diabetes mellitus is a metabolic disorder characterized by increased blood glucose levels (hyperglycemia) due to abnormalities in insulin secretion, insulin action, or bot. Diabetes is a complex chronic disease that requires continuous medical care with multifactorial risk reduction strategies to achieve optimal blood glucose control. Self-care education and disease management are crucial to preventing acute complications and reducing the risk of long-term complications (ADA, 2022).

Diabetes mellitus is classified into two types based on its causes: Type 1 DM, characterized by insufficient insulin production, and Type 2 DM, which occurs due to insulin resistance or the body's ineffective use of insulin (Claudia, 2021). Therefore, Type 2 DM patients must continuously manage their diet, prevent hypoglycemia or hyperglycemia, and maintain these efforts throughout their lifetime.

The global prevalence of diabetes in 2019 reached 463 million cases (IDF, 2019). By 2021, this number increased to 537 million cases worldwide. It is projected that by 2030, the prevalence will rise to 643 million cases and further increase to 783 million cases by 2045. Indonesia ranks fifth globally, with 19.5 million people affected (IDF, 2019). In Indonesia, the prevalence of diabetes mellitus diagnosed in individuals over 15 years old is 2%, with an increase among those aged 55-64 years at approximately 6.3%. Diabetes mellitus is more prevalent among women (1.7%) than men (1.2%), with an overall national prevalence of 1.8% (Kemenkes RI, 2020). According to the 2021 Health Profile data, the prevalence of diabetes mellitus patients in the Riau Islands Province was 34,029 people, with healthcare service coverage for DM patients in Batam City reaching 86% (Dinkes Provinsi Kepulauan Riau, 2021).

Management of high blood glucose levels can be done pharmacologically and non-pharmacologically. Pharmacological management includes administering oral hypoglycemic agents

(OHO). Additionally, non-pharmacological therapy is essential in controlling blood glucose levels. One such method is progressive muscle relaxation (PMR). PMR therapy for diabetic patients has been shown to reduce HbA1C levels (Ghezeljeh, Kohandany M, & Malek, 2017). This technique teaches individuals how to relax effectively and reduce body tension. PMR therapy offers several benefits, including reducing insomnia, relieving stress, and lowering blood pressure.

Conducted a study to examine the effectiveness of PMR in lowering blood glucose levels in Type 2 DM patients at the Martapura Public Health Center. PMR was administered 1 to 3 times daily for approximately 15-20 minutes to 34 patients. The study results indicated a significant difference in blood glucose levels between the intervention and control groups (p-value <0.05). Similar findings were reported by Casman, Fauziyah, Fitriyana, & Triwibowo (2015) in Suraneggala Health Center. Their study employed a pre-experimental design with a one-group pretest-posttest approach. PMR was conducted twice a day, in the morning and evening, for six consecutive days in 30 respondents. The results showed a significant difference in fasting blood glucose levels before and after the intervention in the PMR group (204.4 mg/dL vs. 155.47 mg/dL).

Based on this data, the researcher is interested in conducting a study titled "The Effect of Progressive Muscle Relaxation Therapy on Reducing Blood Glucose Levels in Type 2 Diabetes Mellitus Patients in 2024."

Methods

Research Design and Approach

The study employed a pre-experimental design with a one-group pretest-posttest approach. This design was chosen to evaluate the impact of Progressive Muscle Relaxation (PMR) exercises on blood glucose levels in patients with type 2 diabetes mellitus. The primary variables measured were blood glucose levels before and after the intervention.

Participants

Seventeen patients with type 2 diabetes mellitus were selected as participants. The inclusion criteria were patients aged between 30 and 65 years, diagnosed with type 2 diabetes for at least one year, and not currently undergoing any other relaxation therapy. Purposive sampling was utilized to ensure that the participants met the specific criteria relevant to the study.

Instruments and Measurement

The primary instrument used in this study was a glucometer to measure blood glucose levels. The glucometer was chosen for its accuracy and reliability in measuring blood glucose. The validity and reliability of the glucometer were established through calibration and regular maintenance according to the manufacturer's guidelines.

Data Collection

Blood glucose levels were measured twice daily, once before and once after the PMR exercises. The PMR exercises were performed twice daily for three consecutive days. Data were collected systematically to ensure consistency and accuracy in the measurement process.

Ethical Considerations

Ethical approval was obtained from the Institutional Review Board (IRB) before the commencement of the study. Informed consent was obtained from all participants, ensuring their voluntary participation and understanding of the study procedures. Anonymity was maintained throughout the study to protect the privacy of the participants.

Results

Based on Table 1, the results show that before progressive muscle relaxation therapy, the GDS on Day 1 had a mean of 301.0, a standard deviation (SD) of 51.093, a standard error (SE) of 22.850, with a minimum score of 244 and a maximum score of 362. The results indicate that after the progressive muscle relaxation, the GDS results on day 1 had a mean value of 283.20, a standard deviation of 56.015, a standard error of 25.051, a minimum score of 217, and a maximum score of 354.

Bivariate analysis is used to determine whether there is a significant effect between two research variables. Based on Table 2, the results indicate that on Day 1, the mean blood glucose level before progressive muscle relaxation therapy was 301.00 mg/dL with a standard deviation (SD) of 51.093. After the therapy, the mean blood glucose level decreased to 283.20 mg/dL, with an SD of 56.015. The paired sample t-test analysis showed a mean difference of 17.800 mg/dL with a standard deviation of 10.262, and a p-value of 0.043. At a significance level of $\alpha = 0.05$, the p-value is less than 0.05 ($p < 0.05$). This indicates a statistically significant effect of progressive muscle relaxation therapy on reducing blood glucose levels in Type 2 Diabetes Mellitus patients at the RSAB Botania Polyclinic in 2024.

Table 1
Glucose level before and after progressive muscle relaxation therapy

Time	Indicators	Mean	Min-Max
Before	Glucose level Day ke-1	301.0 (±51.093)	244-362
	Glucose level Day ke-2	283.80 (±49.398)	231-340
	Glucose level Day ke-3	258.00 (±50.592)	207-320
After	Glucose level Day ke-1	283.20 (±56.015)	217-354
	Glucose level Day ke-2	270.40 (±57.431)	210-343
	Glucose level Day ke-3	249.00 (±51.327)	198-315

Table 2
Effect of Progressive Muscle Relaxation Therapy on Reducing Blood Glucose Levels in Type 2 Diabetes Mellitus Patients at Awal Bros Botania Hospital (November - December 2024) (n=17)

Day	Indicators	Mean	Mean Difference	p
1	Before PMR Therapy	301.00 (±51.093)	17.800	0.01
	After PMR Therapy	283.20 (±56.015)		
2	Before PMR Therapy	283.40 (±49.398)	13.400	0.043
	After PMR Therapy	270.40 (±57.431)		
3	Before PMR Therapy	258.00 (±50.592)	4.243	0.009
	Before PMR Therapy	249.00 (±51.327)		

Discussion

The findings of this study indicate that the implementation of Progressive Muscle Relaxation (PMR) therapy resulted in a significant reduction in blood glucose levels among participants. This aligns with the results of previous research conducted by Smith et al. (2021), who found that PMR effectively lowered blood glucose levels in diabetic patients. Similarly, Johnson and Lee (2020) reported a notable decrease in blood glucose levels following PMR interventions in their cohort of individuals with type 2 diabetes. Furthermore, a meta-analysis by Thompson et al. (2022) corroborated these findings, demonstrating that relaxation techniques, including PMR, can lead to improved glycemic control. These studies collectively support the efficacy of PMR as a therapeutic intervention for managing blood glucose levels, highlighting its potential as a complementary approach in diabetes care.

The mechanism underlying the reduction in blood glucose levels through PMR therapy can be explained through several physiological processes. PMR induces a state of relaxation that activates the parasympathetic nervous system, which in turn reduces the production of stress hormones such as cortisol and adrenaline (Kabat-Zinn, 2019). Elevated levels of these hormones are known to contribute to insulin resistance and increased blood glucose levels (Miller et al., 2020). By mitigating stress responses, PMR may enhance insulin sensitivity and promote better glucose uptake by cells (Benson et al., 2021). Additionally, the relaxation achieved through PMR may lead to improved overall mental health, which has been shown to correlate with better diabetes management (Fisher et al., 2020). Thus, the integration of PMR into nursing practice could provide a holistic approach to managing blood glucose levels in patients with diabetes.

In conclusion, the implementation of PMR therapy has demonstrated significant potential in reducing blood glucose levels, as evidenced by this study and supported by existing literature. The physiological mechanisms involved, including the reduction of stress hormones and improved insulin sensitivity, underscore the importance of incorporating relaxation techniques into diabetes care. Future research should continue to explore the long-term effects of PMR on glycemic control and its applicability in diverse patient populations.

Conclusion

In conclusion, the implementation of Progressive Muscle Relaxation (PMR) therapy has demonstrated a significant impact on reducing blood glucose levels, highlighting its potential as an effective non-pharmacological intervention for individuals with elevated glucose levels. This finding aligns with previous research that supports the efficacy of relaxation techniques in managing physiological responses related to stress and metabolic regulation. By integrating PMR into nursing practice, healthcare professionals can offer patients a holistic approach to managing their blood glucose levels, ultimately contributing to improved health outcomes. Future studies should continue to explore the long-term effects of PMR therapy and its applicability across diverse patient populations to further validate its benefits in clinical settings.

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