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Application of Progressive Muscle Relaxation Technique to Reduce Blood Glucose Levels in Elderly with Diabetes Mellitus

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Abstract

Diabetes mellitus is a metabolic disease which is often found in the elderly caused by a degenerative process. Progressive muscle relaxation technique is one of the non-pharmacological therapy to decrease blood glucose levels in diabetes mellitus. This case study aimed to analyzed the effect of progressive muscle relaxation technique on problem of instability of blood glucose levels in elderly. This research design is case study. The sample of this research is one elderly who had diabetes mellitus type 2. The data collection by measuring blood glucose levels during pre-intervention in the morning and post-intervention in the afternoon. The elderly had intervention twice a day for 20 minutes and forward until 5 days. Data collected and processed by using statistical T-test dependent. The elderly with diabetes mellitus type 2 given progressive muscle relaxation technique experienced a decrease in blood glucose levels from pre to post intervention with p-value 0.005 which means it is significant. The application of progressive muscle relaxation technique given to the elderly affect to decrease blood glucose levels in the outcome of pre and post intervention.

Keywords: Diabetes Mellitus type 2, Elderly, Progressive Muscle-Relaxation Technique

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1. BACKGROUND

Diabetes mellitus is a metabolic disease condition characterized by an increase in glucose levels in the blood (Forouhi & Wareham, 2019). This disease is often found in the elderly group caused by the degenerative process (Longo et al., 2019). The most common diabetes mellitus disease found by the elderly is diabetes mellitus type 2. As many as 90% of type 2 diabetes mellitus is the most common type of diabetes found or found in humans, especially in the elderly over 65 years old (Milita et al., 2021). Data from the International Diabetes Federation (IDF) in 2019 showed that as many as 19.3% of the

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elderly aged 65-99 years in the world suffer from type 2 diabetes mellitus with the number of elderly people amounting to 136.5 million. In 2030, it is predicted that the elderly aged >65 years with type 2 diabetes mellitus will experience an increase of 195.2 million elderly people with diabetes. Then in 2045 it is predicted to increase to 276.2 million elderly people with diabetes. China ranks first in the country with 78.1 million elderly people with type 2 diabetes mellitus. Then the United States of America (USA) ranks second with type 2 diabetes mellitus with 27.5 million elderly people with type 2 diabetes mellitus (Sinclair et al., 2020).

Indonesia itself is the Southeast Asian region which occupies the 10th position of the elderly with type 2 diabetes mellitus, namely 10.7 million elderly people with type 2 diabetes mellitus. Based on data from the health profile of Southeast Sulawesi Province, especially in Bau-Bau City, in 2019 as many as 1,642 elderly people (10%) experienced type 2 diabetes mellitus out of a total of 17,225 elderly people (Meilani et al., 2022). The percentage of diabetes mellitus incidence in Bondowoso in 2022 is based on data from the Bondowoso Regency Health Office as many as 12,717 people (Dinas Kesehatan Bondowoso, 2022). In 2020, there were 924 people in Wonosari District with type 2 diabetes mellitus, and 190 of them were elderly people with type 2 diabetes mellitus (Azizah et al., 2022).

Aging is one of the phases of the developmental stage. At this stage, there will be a process of change in the physical and psychological and the behavior that will be aimed at (Longo et al., 2019). The elderly will experience a deterioration in their body functions which can be characterized by a decrease in fitness level, a decrease in the body's ability to maintain homeostatic, and progressive organ function, inability to adapt to the surrounding environment, decreased body complexity structure processes and body anatomical structures, and increased risk of death (Williams, 2019; Astuti Reini et al, 2023). The older a person gets, the more hormone levels in the body will experience changes in their production, as well as the production of the hormone insulin in the body which plays an important role in the stability of blood glucose levels which will cause problems resulting in diabetes (Kennedy-Malone et al., 2019).

Treatment of diabetes mellitus can be done pharmacological or non-pharmacological methods. One of the non-pharmacological therapies that can be given is the Progressive Muscle Relaxation

(ROP) technique. The progressive muscle relaxation technique is one of the non-pharmacological techniques that uses muscles as the main ingredient in performing the technique. This technique involves muscles in the body so that patients will better distinguish the condition of the muscles when tensioned and the muscles when relaxed so that it can provide a relaxing effect (Himmah et al., 2024). This technique is able to provide a lot of oxygen consumption in the body, increase metabolic processes in the body, speed up digestion, relax muscle tension, balance systolic and diastolic blood pressure, lower glucose levels in the blood, and increase alpha brain waves (Nurfadilah et al., 2023).

The researcher provided a non-pharmacological intervention in the form of progressive muscle relaxation techniques in overcoming the problem of instability of blood glucose levels in the elderly with type 2 diabetes mellitus. This intervention, in addition to being able to stabilize the blood glucose levels of the elderly, can also increase the relaxing effect on the elderly so that the output produced by the elderly blood glucose levels can become normal again (Putri et al., 2023).

2. METHODS

This study uses a pre-test and post-test case study research design. This research was conducted at UPT PSTW Bondowoso from 1 to 5 March, 2024. This study used one respondent, namely the elderly who experienced type 2 diabetes mellitus. The selection of respondents was carried out based on inclusion criteria. The inclusion criteria are the elderly who are willing to participate in a series of research activities or research procedures from start to finish, the elderly who experience type 2 diabetes mellitus, the elderly who have a glucose level value of ≥ 200 mg/dl, the elderly who take oral antidiabetic drugs. Data collection was carried out using a glucometer before and after the intervention. The intervention is given twice a day at morning 09.00 a.m. and afternoon 15.00 p.m for 5 days. Then, the measurement results are documented on the blood sugar observation sheet every day.

3. RESULTS

The elderly before the progressive muscle relaxation technique is given, blood sugar is checked with the result of a blood glucose value of 389 mg/dl. This proves that the elderly have type 2 diabetes mellitus with blood glucose results above 200 (>200

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mg/dl). The complaints felt by the elderly at that time were that they were tired easily, often felt thirsty, and often went to the bathroom for urination.

The elderly are checked for blood glucose before and after being given intervention at each meeting. The results of the blood glucose examination of the elderly at each meeting for 5 meetings and 10 interventions are listed in the following table.

Table 1. Results of blood glucose value checks at each pre-test and post-test meeting of elderly at UPT PSTW Bondowoso

Meeting	Blood Glucose Levels		Difference
	Pre-test	Post-test	
1st	431 mg/dl	306 mg/dl	125 mg/dl
2nd	225 mg/dl	175 mg/dl	50 mg/dl
3rd	356 mg/dl	179 mg/dl	177 mg/dl
4th	380 mg/dl	280 mg/dl	100 mg/dl
5th	267 mg/dl	144 mg/dl	123 mg/dl

Table 2. Difference in blood glucose level values pre-test and post-test for elderly at UPT PSTW Bondowoso

Blood Glucose Level	Mean	S.D.	*P Value*
Pre-mplementation	331.80	84.194	0.005
Post-Implementation	216.80	71.461	

The provision of interventions for progressive muscle relaxation techniques was carried out in 5 meetings, 2 interventions each meeting with a pre-test was carried out before being given progressive muscle relaxation techniques at 09.00 WIB, then the elderly carried out the intervention given, after which a post test was carried out after being given an intervention at 15.00 WIB. It can be seen in the graph that there is a decrease in blood glucose before and after the intervention of progressive muscle relaxation techniques every day. It was stated at each meeting that there was a change in the value of blood glucose levels before and after the intervention was given. The first blood sugar check was on March 1, 2024 at 09.00 WIB before the intervention, then the elderly intervened twice at each meeting and then at 15.00 WIB a blood sugar check was carried out after the intervention was carried out and so on for 5 meetings.

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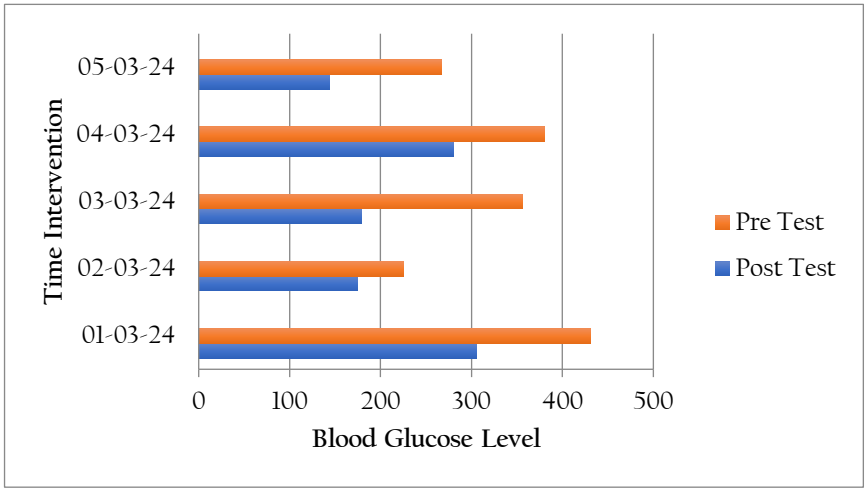

Figure 1. Blood Glucose Level

4. DISCUSSION

The aging process experienced by the elderly causes their condition to gradually deteriorate, ranging from a decrease in fitness levels, a decrease in the ability to maintain the body's homeostatic, a progressive decline in organ function, a loss of physiological complexity in the body and the anatomical structure of the body (Astuti et al, 2021). Most people with type 2 diabetes mellitus are most commonly found in the age range of >40 years. This condition is related to the process of deterioration of the body's physiological functions as we age. The ability of the pancreas to produce insulin will decrease. In addition, increasing age also increases the risk factors for insulin resistance in the body and decreased insulin secretion, causing suboptimal blood glucose control (Oktavia et al., 2022).

The elderly in this study are female and are currently entering the menopausal phase. A phase where he no longer experiences menarche or menstruation. This is due to a decrease in the production of the estrogen and progesterone. The decrease in hormone production turns out to have an effect on the insulin sensitivity produced, insulin will experience a decrease in sensitivity and its response in the body will decrease (Arania et al., 2021). In addition, the decrease in the production of these hormones causes the accumulation of fat distribution in the body, potentially resulting in obesity (Rosita et al., 2022). The accumulation of fat in the body is the cause of impaired insulin performance in the body due to abnormal integration between the insulin receptor complex and glucose delivery (Vadila et al., 2021).

The weight of the elderly is currently 70 kg and TB: 155 cm. when

calculated based on BMI, the elderly have a BMI of 29.1. According to PERKENI (2021), BMI classification is categorized as less BB (BMI<18.5). Normal BB (BMI 18.5-22.9). More weight (≥23), risk (23-24.9), Obesity I (25-29.9), Obesity II (≥30). Based on BMI classification, the elderly are included in the Obesity I category with a BMI of 29.1. The obesity condition experienced by the elderly contributes to the occurrence of type 2 diabetes mellitus that he is currently experiencing. This is because there is an accumulation of fat in the body which results in an increase in the number of insulin receptors in cells throughout the body. This condition results in the elderly body not responding to full insulin in the body so that the elderly experience insulin resuscitation which is the cause of type 2 diabetes mellitus (Suwinawati et al., 2020).

The results showed that there was a difference in blood glucose level values before and after the intervention of the progressive muscle relaxation technique during 5 meetings. The average value of blood glucose levels before the intervention was 331.80 and the average value of blood glucose levels after the intervention was 216.80. Based on the results of the average value before and after the intervention, there was a significant decrease in the value of blood glucose levels. In the results of the statistical test that has been carried out, the significance value of the p value is 0.005 (<0.05). This can be interpreted that there is a difference in the value of blood glucose levels before and after the intervention of the progressive muscle relaxation technique.

The progressive muscle relaxation technique is one of the light activities that can be done in daily life and is easy to do. The results of the evaluation after the progressive muscle relaxation technique was carried out to Mrs. S showed that there was a decrease in the value of blood glucose levels. Research conducted by Anggun et al (2023) showed that the progressive muscle relaxation technique was able to reduce blood glucose levels in the elderly with diabetes mellitus. This technique has a positive effect on the body of the elderly. The elderly will feel more relaxed. The parasympathetic nervous system in the body will stimulate the hypothalamus in lowering the hormone Corticotropin Releasing Hormone (CRH). This decrease in hormone will also decrease the secretion of the hormone ACTH. This condition will inhibit the adrenal cortex in producing the hormone cortisol which plays a role in stressful situations. Decreased production of the hormone cortisol will inhibit the process of gluconeogenesis and increase

the use of glucose in cells. So that glucose levels in the blood can decrease (Bistara & Susanti, 2022).

5. CONCLUSION

There was a difference in the value of blood glucose levels before and after the intervention of progressive muscle relaxation techniques to the elderly with a significance value of 0.005 (<0.05). This can be interpreted that the application of progressive muscle relaxation techniques can lower blood glucose levels when people with type 2 diabetes mellitus suffer. This study is expected to be able to be used as a reference material in developing other research on progressive muscle relaxation technique interventions in overcoming the problem of instability of blood glucose levels in the elderly with type 2 diabetes mellitus.

AUTHOR CONTRIBUTIONS

The author contribute all research activity such as conceptualization, data curation, analysis, writing & editing, manuscript revisions.

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CONFLICT OF INTEREST

The authors declare no conflict of interest for this publication.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

REFERENCES

Arania, R., Triwahyuni, T., Esfandiari, F., & Nugraha, F. R. (2021). Hubungan Antara Usia, Jenis Kelamin, dan Tingkat Pendidikan Dengan Kejadian Diabetes Melitus di Klinik Mardi Waluyo Lampung TengaIh. Jurnal Medika Malahayati, 5(3), 146–153. https://doi.org/10.33024/jmm.v5i3.4200

Azizah, M., Khotimah, H., & Kholisotin, K. (2022). Efektifitas Diabetes Self Management Education (DSME) terhadap Kepatuhan Penderita Diabetes Mellitus Tipe 2 pada Masa Pandemi Covid-19. Jurnal Penelitian Perawat Profesional, 4(2), 707–712. https://doi.org/10.37287/jppp.v4i2.83

3

Bistara, D. N., & Susanti, S. (2022). the Effectiveness of Progressive Muscle Relaxation on Blood Sugar Levels of Type 2 Diabetes Mellitus Patients. Jurnal Keperawatan Respati Yogyakarta, 9(2), 94–98. https://doi.org/10.35842/jkry.v9i2.671

Dinas Kesehatan Bondowoso. (2022). Profil Kesehatan Kabupaten Bondowoso Tahun 2022. 13, 155. https://sadab.bondowosokab.go.id/sl/dataset/buku-profil-kesehatan-kabupaten-bondowoso

Forouhi, N. G., & Wareham, N. J. (2019). Epidemiology of diabetes. Medicine (United Kingdom), 47(1), 22–27. https://doi.org/10.1016/j.mpmed.2018.10.004

Himmah, F., Nistiandani, A., Hakam, M., & Setyowati, S. (2024). Progressive Muscle Relaxation for Anxiety and Hyperglycemia in Diabetes Mellitus Type 2 Patient: A Case-Study . Jurnal Kegawatdaruratan Medis Indonesia, 3(1), 12–23. https://doi.org/10.58545/jkmi.v3i1.129

Kennedy-Malone, L., Martin-Plank, L., & Duffy, E. G. (2019). Advanced Practice Nursing in the Care of Older Adults. In Journal of Physics A: Mathematical and Theoretical.

Longo, M., Bellastella, G., Maiorino, M. I., Meier, J. J., Esposito, K., & Giugliano, D. (2019). Diabetes and aging: From treatment goals to pharmacologic therapy. Frontiers in Endocrinology, 10(FEB). https://doi.org/10.3389/fendo.2019.00045

Meilani, N., Azis, W. O. A., & Saputra, R. (2022). Faktor Resiko Kejadian Diabetes Mellitus Pada Lansia. Poltekita : Jurnal Ilmu Kesehatan, 15(4), 346–354. https://doi.org/10.33860/jik.v15i4.860

Milita, F., Handayani, S., & Setiaji, B. (2021). Kejadian Diabetes Mellitus Tipe II pada Lanjut Usia di Indonesia (Analisis Riskesdas 2018). Jurnal Kedokteran Dan Kesehatan, 17(1), 9–20. https://doi.org/10.24853/jkk.17.1.9-20

Nurfadilah, A., Rohmah, M., Fuadah, S., & Saputra, R. (2023). Studi Kasus: Pasien Diabetes Melitus Tipe 2 Dengan Terapi Relaksasi Otot

Progresif Terhadap Ketidakstabilan Kadar Glukosa Darah. Jurnal Keperawatan, 6(1), 6. https://www.risji.com/index.php/jurkep/article/view/5

Oktavia, S., Budiati, E., Masra, F., Rahayu, D., & Setiaji, B. (2022). Faktor - faktor Sosial Demografi yang Berhubungan dengan Kejadian Diabetes Melitus Tipe 2 . Jurnal Ilmiah Permas: Jurnal Ilmiah STIKES Kendal, 12(4), 1039–1052. Retrieved from https://journal2.stikeskendal.ac.id/index.php/PSKM/article/view/287

Putri, P., Janah, N., & Prajayanti, E. D. (2023). Penerapan Relaksasi Otot Progresif Terhadap Kadar Gula Darah Penderita Diabetes Melitus Tipe 2 Di Dusun Jengglong Kabupaten Karanganyar. Jurnal Inovasi Riset Ilmu Kesehatan, 1(4), 78–89. https://doi.org/10.55606/detector.v1i4.2508

Rosita, R., Kusumaningtiar, D. A., Irfandi, A., & Ayu, I. M. (2022). Hubungan Antara Jenis Kelamin, Umur, Dan Aktivitas Fisik Dengan Diabetes Melitus Tipe 2 Pada Lansia Di Puskesmas Balaraja Kabupaten Tangerang. Jurnal Kesehatan Masyarakat (UNDIP), 10(3), 364–371. https://doi.org/10.14710/jkm.v10i3.33186

Sinclair, A., Saeedi, P., Kaundal, A., Karuranga, S., Malanda, B., & Williams, R. (2020). Diabetes and global ageing among 65–99-year-old adults: Findings from the International Diabetes Federation Diabetes Atlas, 9th edition. Diabetes Research and Clinical Practice, 162, 108078. https://doi.org/10.1016/j.diabres.2020.108078

Suwinawati, E., Ardiani, H., & Ratnawati, R. (2020). Hubungan Obesitas Dengan Kejadian Diabetes Melitus Tipe 2 Di Posbindu PTM Puskesmas Kendal Kabupaten Ngawi. Journal of Health Science and Prevention, 4(2), 79–84. https://doi.org/10.29080/jhsp.v4i2.388

Vadila, A., Izhar, M. D., & Nasution, H. S. (2021). Faktor-faktor kejadian diabetes melitus tipe 2 di puskesmas putri ayu. Media Kesehatan

Politeknik Kesehatan Makassar, XVI(2), 229–237. https://doi.org/10.32382/medkes.v16i2.2282

Williams, P. (2019). Psycholsocial Care of Older Adults. In Basic geriatric nursing. Elsevier Health Sciences