CARING:
Indonesian Journal of Nursing Science

The Effect of Prolanis Exercise on Reducing Blood Sugar Levels

Wirda Faswita[1], Leny Suarni[1], Anggi Lauviga [1]

[1]STIKes Sehat Medan

Abstract. *Diabetes mellitus* (DM) is a dangerous disease because it causes many complications. Prolanis Exercise is one of the physical activities for people with Diabetes Mellitus (DM) to lower blood glucose levels. This study aims to determine the effect of prolanis exercise on reducing patients' blood glucose levels in the working area of the southern Namu Ukur Health Center. The Quasi Experiment method with a one-group pretest-posttest design is used as a research design. This study also used a purposive sampling method with 28 respondents. Prolanis Exercise exercises were used as the data collection tool. The results showed that there was an effect of prolanis exercise on decreasing blood glucose levels in people with Diabetes Mellitus (DM) in the working area of the Namu Ukur Health Center with a value of 0.004 (α<0.05). Before treatment, blood sugar levels were an average of 270 mg/dL and 257 mg/dL after the treatment. Patients with Diabetes Mellitus (DM) should carry out regular physical activities in routine such as prolanis exercise.

Keywords: Blood glucose level*; Diabetes Mellitus (DM)*; prolanis exercise

Received 29th October 2021 | Revised 12th December 2021 | Accepted 24th December 2021

*Corresponding author at: STIKes Sehat Medan, Gaperta Ujung Tanjung Gusta Medan Kecamatan Medan Helvetia, Medan, Sumatera Utara, Indonesia

E-mail address: wirdafaswita@gmail.com

e-ISSN: 2685-7162
Journal Homepage: https://talenta.usu.ac.id/IJNS

1. Introduction

Diabetes Mellitus (DM) is a very dangerous disease because it can cause many complications. Complications due to Diabetes Mellitus significantly increase morbidity and mortality. There are a lot of diseases that cause damage to different parts of the body. These include things like blindness, heart disease, diabetic foot, and so on (Sutanto, 2018).

According to *American Diabetes Association* (2018), Hyperglycemia can happen because of problems with insulin production, insulin action, or both. DM is a group of metabolic diseases that are all linked to hyperglycemia. This is a disease that can be found all over the world, and it is very common. The number of incidents continues to rise sharply and even tends to be worrying. Diabetes Mellitus can cause complications such as diseases of the eyes, heart, nerves, and kidneys and lead to amputation. Type 1 diabetes mellitus and type 2 diabetes mellitus are both types of diabetes mellitus. Type 2 Diabetes mellitus is more frequent than diabetes mellitus type 1. Type 2 Diabetes mellitus is one of the most common causes of death, accounting for around 2.1 percent of all deaths globally (Perkeni, 2019).

DM disease causes some very dangerous complications. Various complications of Diabetes Mellitus can cause distress. Distress is an unavoidable body response, and everyone experiences it. It has a negative impact that can interfere with physical, spiritual, social, psychological, and individuals' intellectual. Compared to the general population, Diabetes Mellitus patients have a higher level of distress. Diet treatment also makes one experience higher distress than treatment using insulin because one has to regulate and change his lifestyle. Distress and Diabetes Mellitus have a close relationship and greatly influence people, especially urban residents. Both influence their social life, life pressures, and unhealthy lifestyle. Factors such as surroundings, emotional, coping, and knowledge can increase distress in Diabetes Mellitus patients because these factors are commonly appear in life (Karlsen et al., 2012).

According to WHO (2019), it is estimated that 422 million people suffered from DM in 2014 globally. One of the factors causing DM is the surroundings that are lifestyle changes. This is due to increased risk factors such as being overweight or obese. Another factor is high blood sugar. High blood sugar results in an 80% increase in mortality and the risk of cardiovascular disease and other diseases. As much as 43% of the 3.7 million deaths caused by DM usually occur to people aged before 55 – 50 years old. Meanwhile, In Indonesia, the prevalence of diabetes mellitus has risen dramatically in the previous five years. In 2013, the DM prevalence reached 6.9 percent, and it continued to increase to 8.5 percent in 2018, Riskesdas (2018). In North Sumatra province, it has a 1.8% DM prevalence which is 160 thousand people suffering from the disease. According to the findings of the 2013 North Sumatra Basic Health Research, 1.8 percent of 15-year-olds were diagnosed with Diabetes Mellitus. Deli Serdang had the highest prevalence of Diabetes Mellitus diagnosis (2.9%), followed by Medan (2.7%),

Pematang Siantar (2.2%), Asahan Regency (2.1%), Gunung Sitoli (2.1%), and Mandailing Natal Regency (0.3%) (Ministry of Health of the Republic of Indonesia, 2020).

One of the highest causes of DM is having a poor lifestyle, such as overeating, reduced physical activity, and obesity. Thus, one can suffer from DM even their family do not suffer from DM before. The disease will be going on for years without any symptoms (Dewanti, 2010). Prasetyani's (2017) mentioned several factors such as sex, obesity, occupation, and activity. In her research, Obesity is the dominant factor of type 2 DM (p-value = 0.02 : 0.05). An obese person is 5.45 times riskier to suffer from type 2 DM than a non-obese person.

Regularly exercising and having a healthy lifestyle can overcome DM caused by an unhealthy lifestyle. Fundamentally, exercises for people with diabetes are no different from healthy people or old and new diabetics. Exercise is one of the DM management pillars in addition to education, nutritional therapy, and pharmacological intervention. Among the benefits of exercise for people suffering from diabetes mellitus are decreased blood sugar, preventing obesity by burning the calories so the blood sugar will be used as the energy source, resulting in decreased blood sugar (Damayanti, 2018). This is also in line with Herdianty Zahira (2020)'s research that most of her participants had increased blood sugar. After being tested with Wilcoxon test, p-value < 0.05 shows that exercise played an essential role in reducing blood sugar levels.

Patima et al., (2019)'s research showed a significant difference in blood glucose levels in respondents fasting before and after participating in aerobic exercise with a p-value < 0.05. Before exercising, the blood glucose level is 81.66 ± 13.14 mg/dl. After exercising, the blood glucose level is 67.81 ± 4.49 mg/dl. It shows that Prolanis Exercise can reduce blood glucose levels. The statement is also supported by Paramitha (2014) which explains that routine physical activity would reduce blood sugar levels and vice versa. If one does not conduct physical activity routinely, Diabetes mellitus patients will increase their blood sugar levels. Conducting a physical activity such as prolanis exercise will improve elderly physical fitness. Indirectly, prolanis exercise increases heart function, lowers blood sugar levels, and lowers the risk of fat buildup on blood vessel walls, allowing them to maintain their elasticity. Also, the exercise will train heart muscle to contract, so its pumping ability will always be maintained.

A survey conducted by the researchers at Namu Ukur Community Health Center showed that from 6 elders, two people exercised to fill their spare time and socialized with other elders. Another two people said that they exercised to improve their fitness. The last two people said they exercised to lower their blood sugar levels. Based on this data, it turns out that elders still do not know the benefit of exercising. The benefits of exercise are avoiding the possibility of obesity, preventing and treating diabetes type 2. By exercising, insulin will work better, so the muscle cells use glucose to be burned (Soegondo, 2011).

According to the data of Namu Ukur Community Health Center, 90 people were diagnosed with Diabetes mellitus in January 2020. In June 2020, the number reduced to 62 people. Nevertheless, it did not last long because there were 72 people diagnosed with Diabetes Mellitus in December. In 2020, 625 people suffering from Diabetes Mellitus were registered in the data bank of Namu Ukur Community Health Center. Namu Ukur Community Health Center also has a work program called Posyandu for the elderly. One of the programs is an exercise for the elderly. The health center carries out this activity once a month in each village. There are 409 elders in South Namu Ukur village, Sei Bingai District, Langkat regency. Around 25-30 elders participate in the elderly exercise every month. Fifteen elders of the total elders suffering from Diabetes Mellitus also participate in the exercise of the Healthy Living Community Movement (GERMAS). The less participation is due to a lack of knowledge about the benefits of exercise and a lack of self-awareness to improve one's health (Namu Ukur Health Center, 2019).

Based on the description above, the author is interested in researching "The Effect of Prolanis Exercise on Reducing Blood Sugar Levels in Diabetes Mellitus Patients at the South Namu Ukur Village Health Community Center, Sei Bingai District, Langkat Regency"

2. Research Methods

The study used a quasi-experiment using a one-group pretest-posttest design. The research was conducted in the working area of the South Namu Ukur Health Community Center in September 2021. The samples are 28 elders who suffered from DM. This research also used the purposive sampling technique. It is a sampling technique based on a consideration that the elderly group has been formed in the working area of South Namu Ukur Health Community Center. The inclusion criteria in this study are:

a. People suffered from DM
b. To be domiciled in the working area of the South Namu Ukur Health Community Center
c. 45-65 years old
d. Be present during the research
e. Willing to be a respondent

The exclusion criteria for this study are:

a. DM patients with complications
b. Loss of consciousness

In carrying out this research, researchers have obtained approval to pass the ethical test of the Medan Health STIKes Research Ethics Institute. After receiving the ethics test letter, the researcher submitted a research application to the Namu Ukur South Binjai Health Community Center and asked for permission from the Head of the Health Community Center. Then, the researcher explained the purpose and made a work contract of the research duration.

According to R Puspitha et al. (2020), prolanis exercise is a physical exercise for people with chronic diseases by using a proactive approach carried out in an integrated manner involving the Health Facility Participants and BPJS Kesehatan to maintain the health of BPJS Kesehatan's participants. Paramitha (2014) prolanis exercise would improve heart function, lower blood sugar levels, and reduce the risk of fat accumulation on the blood vessel walls to maintain its elasticity. Also, the exercise will train heart muscle to contract, so its pumping ability will always be maintained. For this study, the prolanis exercise carried out was a physical fitness exercise that had been modified and referred to the prolanis exercise published by the Cijantung Main Program and adapted to the condition of the participants and was also guided by an Exercise instructor. This prolanis exercise is carried out once a week for 60 minutes consisting of 10 minutes of warm-up, 40 minutes of core movement, and 10 minutes of cooling down.

The instrument for this study used a modified prolanis exercise. It used a glucose test as a measuring tool, and after measuring the results, the results were written in an observation sheet. After the data is collected, data processing is carried out through the editing, coding, scoring, and entry stages. Next, perform data analysis with univariate analysis, which explains or describes each research variable. Data can be presented in the form of frequency distribution tables and percentages (Notoatmojo, 2018).

Hypothesis testing is done by t-test with SPSS 26. The decision criteria taken first are H0 is rejected. Ha is accepted with a significance value of less than 0.05 or p-value <0.05, which means that there is an effect of prolanis exercise on decreasing blood sugar levels in DM patients. On the contrary, if H0 is accepted and Ha is rejected with a p-value > 0.05, there is no effect of prolanis exercise on reducing blood sugar levels in DM patients.

3. Research Result

The result shows that 12 people aged <45 years old (42.86%), 15 people are high school educated (57.14%), and 13 people are unemployed (46.43%). The data can be seen in the following table.

Table 1 Frequency distribution and percentage of respondent's characteristics (n=28)

No	Characteristics	Frequency (f)	Percentage (%)
1.	**Age**		
	< 45 years old	12	42.86
	45 – 50 years	11	39.28
	> 65 years old	5	17.86
2.	**Education**		
	Elementary School	2	7.14
	Junior High School	3	10.72
	Senior High School	16	57.14
	University	7	25.00

No	Characteristics	Frequency (f)	Percentage (%)
3.	**Occupation**		
	Unemployed (IRT)	13	46.43
	Housewife (IRT)	7	25.00
	Household Assistant (ART)	1	3.57
	Civil Servant	7	25.00

Based on the below table, 13 respondents of DM sufferers (46.43%) had normal blood sugar levels (>300 mg/dl) before participating in prolanis exercise. The data can be seen in the following table.

Table 2 Frequency distribution and percentage of respondents' blood sugar levels before treatment in the Working Area of the South Namu Ukur Health Community Center (n=28)

No.	Category	Frequency (f)	Percentage (%)
1.	< 200 mg/dL	5	17.86
2.	200-300 mg/dL	10	35.71
3.	>300 mg/dL	13	46.43

After participating in prolanis exercise, 22 respondents of DM sufferers (78.57%) had blood sugar levels of 200-300 mg/dl. The data can be seen in the following table.

Table 3 Frequency distribution and percentage of respondents' blood sugar levels after treatment in the Working Area of the South Namu Ukur Health Community Center (n=28)

No.	Category	Frequency (f)	Percentage (%)
1.	< 200 mg/dL	5	17.86
2.	200-300 mg/dL	22	78.57
3.	>300 mg/dL	1	53.57

Table 4 The effect of prolanis exercise on reducing blood sugar levels in the Working Area of the South Namu Ukur Health Community Center (n=28)

No.	Blood Sugar Level	mean	Standard Deviation	*P Value*	n
1.	Before	270.4643	47.67365	0.004	28
2.	After	256.8929	38.32738		

Using the statistical test of T-test, the results showed that before and after participating in prolanis exercise affects the blood sugar levels with the result of 0.004 (α <0.05). Specifically reducing

blood sugar levels in people with diabetes mellitus in the working area of South Namu Ukur Health Community Center.

4. Discussion

a. Characteristics of Respondents

1) Age

The frequency distribution of respondents based on age, education, occupation, and sex in the working area of South Namu Ukur Health Community Center shows that most respondents (12 people, 42.86%) are <45 years old. The DM prevalence indicates an increase as one gets older, and it reached its peak at the age of 55-64 years old. The DM prevalence will decrease after passing that age range. This increment pattern shows that the older a person is, the greater the risk of developing DM disease. In addition, the increase of DM prevalence in 2013-2018 happened to the age group of 45-54, 55-64, 65-74, and 75 years old (Ministry of Health of the Republic of Indonesia, 2020). This is supported by Susilawati & Rahmawati (2021) research results. They mentioned a correlation between age and the case of type 2 diabetes with a p-value = 0.000 (α <0.05). In addition, Komariah and Rahayu (2020) research results shows a correlation between age and blood sugar levels of fasting person. The obtained p-value was 0.004, and the elderly age category was 45-65 years old, with the highest number of 46.2%. It showed that the ability of pancreatic beta cells to produce insulin had reduced in elderly. Also, the activity of mitochondria in muscle cells was reduced by 30%, which causes insulin resistance.

2) Education

The results showed that most respondents (16 people, 57.14%) are high school educated, followed by a university graduate with seven people (25%). RISKESDAS (2018) data shows that respondents with higher education levels had the highest proportion with 2.5% and 2.8%, respectively. In contrast, respondents with lower education levels had less than 2% prevalence. It can be assumed that people with higher education levels have a higher chance of accessing case detection in health services and unhealthy lifestyles (Ministry of Health of the Republic of Indonesia, 2020). According to Heroes and Nugroho (2019), there was a correlation between education level and DM case with a p-value = 0.002. People with low education levels are 3.895 times riskier to suffer from DM than ordinary people with OR value of 4.895, 95% CI 10826-13,119. People with higher education usually work in the office, reducing their physical activity. While people with lower education levels, they tend to work as laborers or farmers, which requires heavy physical activity.

3) Occupation

Based on the occupation, most respondents are entrepreneurs (13 people, 46.43%). This is not in line with RISKESDAS (2018) data on most DM sufferers based on occupation. According to RISKESDAS (2018) data, people who have an occupation as civil servants (PNS), military officers (TNI), police officers (Polri), employees in BUMN/BUMD are often suffering from DM. This is because the percentage between working and non-working groups is not balanced. Most respondents fall under the unemployed group. This group contains housewives who do not necessarily have low physical activity. They are carrying out various activities, including sweeping, cooking, and washing, which may trigger stress. Syatriani, 2019 showed that there was a correlation between working and stress. The p-value = 0.017 which is <0.05. The correlation magnitude with stress is -0.22, which means a strong correlation between working and stress. Also, the correlation is reversed, meaning the better the occupation, the fewer stress symptoms occur.

4) The Effect of prolanis exercise on reducing blood sugar levels in Diabetes Mellitus patients

Based on the research results related to the glucose levels identification of respondents after exercising, it was found that most respondents (10 people, 40%) who took part in the exercise had moderate blood sugar levels (200-300 mg/dl). Blood sugar levels can decrease due to many factors such as nutritional intake, diet, and physical activity. The researchers argued that physical exercise not only maintains one's fitness but also loses one's weight and improves insulin sensitivity. Thus, it will improve glucose control in the blood. The recommended physical exercise is aerobic exercises such as walking, cycling, jogging, and swimming. Physical exercise should be adjusted to one's age and fitness. Also, try to avoid living a sedentary or lazy life. The research result shows that blood sugar levels change after exercising. While exercising, the cells burned the glucose in the blood using insulin catalyst resulting in energy. One who exercises will have a catalytic effect on insulin, so the cells will quickly burn the glucose in the blood. In contrast, people with insulin resistance have higher glucose levels stored as fat. Then, the glucose will be excreted from the body as urine.

According to MOH, R. (2013), exercising for people with diabetes mellitus causes an increase in blood glucose usage by the active muscles. Thus, exercise directly reduces body fat levels, control blood glucose levels, improve insulin sensitivity, and reduce stress. Lack of exercise is one of the factors causing Type II diabetes mellitus. In addition, exercise changes respondent's lifestyle and their glucose levels.

Based on the t-test, the p-value is 0.004, meaning p-value <0.05. it shows that there is a correlation between prolanis exercise towards blood sugar levels in people with Diabetes mellitus in the working area of South Namu Ukur Health Community Center. The researchers argued that exercising influences glucose levels and are closely related to blood glucose's burning system in the cells through insulin performance. The cause is light exercises or lack of movement resulting in an imbalance between the energy needed and those expended. The higher the amount of excess energy, the greater

the fat reserves, increasing one's body size. At the same time, insulin sensitivity is closely related to exercising. Individuals who exercise have balanced glucose levels because insulin effectively turns glucose into energy. This statement is in line with Mulyaningtyas et al., (2012)'s research. In her research, there are different blood glucose levels before and after in people who exercise routine three times a week. The group consists of 42 patients with Diabetes Mellitus in Panti Wilasa Dr. Cipto Semarang Hospital. The p-value of those patients is p = 0.0001, and the p-value of people not exposed to Diabetes Mellitus is p = 0.0001. The average decrease of blood sugar levels of people exposed to the disease is 2.3 times greater than those not exposed to the disease. The decrease ratio is 31.5mg/dl to 13.5mg/dl.

Based on Xin Zheng (2020)'s about the exercise effect on blood glucose and glycemic variability in Indonesia's people with type 2 diabetes. The research showed that the medium-acute intensity exercise before breakfast reduces blood glucose. Also, exercising significantly reduces the fluctuation of blood glucose and improves blood glucose control throughout the day. Exercise is a common term for each body movement due to muscle movement to increase energy usage. It controls blood sugar by turning glucose into energy. Exercise cause insulin to increase so that the blood sugar levels will reduce. For people who rarely exercise, the food they consume is not burned but is stored in their body as fat and sugar causing Diabetes Mellitus (Ministry of Health, 2018)

5. Conclusions and Suggestions

From the research, it can be concluded that 10 respondents (40%) had moderate blood glucose levels (200-300 mg/dl) before doing the exercise. After doing the exercise, 22 respondents (85%) have moderate blood glucose levels (200-300 mg/dl). Thus, there is a correlation between prolanis exercise with blood sugar levels in people with diabetes mellitus in the working area of South Namu Ukur Community Health Center.

For future research, other researchers should research other physical activities that can reduce blood sugar levels in people with DM, such as 30 minutes walking or cycling routine every day. Also, people with DM can increase their exercise time-spent more than 30 minutes and exercise 3-4 times a week.

REFERENCES

[1] American Diabetes Association. (2018). Standard medical care in diabetes 2018. The Journal of Clinical and Applied Research and Education, 41(January). https://doi.org/10.2337/dc18-Sint01

[2] Damayanti. (2018). Diabetes Mellitus & Nursing Management. Nuha Medika.

[3] MOH, R. (2013). Guidelines for Controlling Diabetes Mellitus and Metabolic Diseases Director General of Disease Control and Environmental Health.

[4] Dewanti, S. (2010). Smart Book on Cholesterol, Diabetes Mellitus, and Gout Health. Our friends.

[5] Herdianty Zahira, FSF (2020). The Effect of Exercise on Changes in Blood Sugar Levels During Prolanis Exercise Participants Journal of Health Management Foundation Dr. Hospital Soetomo, Vol 6 No 2, 255–262.

[6] Karlsen, B., Oftedal, B., & Bru, E. (2012). The relationship between clinical indicators, coping styles, perceived support and diabetes-related distress among adults with type 2 diabetes. Journal of Advanced Nursing, 68(2), 391–401. https://doi.org/10.1111/j.1365-2648.2011.05751.x

[7] Ministry of Health of the Republic of Indonesia. (2018). Infodatin-Diabetes.Pdf. Data and Information Center of the Ministry of Health.

[8] Ministry of Health of the Republic of Indonesia. (2020). Stay Productive, Prevent And Overcome Diabetes Mellitus. In the data and information center of the Indonesian Ministry of Health.

[9] Komariah, & Rahayu, S. (2020). Relationship of Age, Gender and Body Mass Index with Fasting Blood Sugar Levels in Type 2 Diabetes Mellitus Patients at the Proclamation Outpatient Primary Clinic, Depok, West Java. Kusuma Husada Health Journal, Dm, 41–50.

[10] Mulyaningtyas, UO, Azam, M., & Anggraini, DN (2012). The Effect of Exercise on Blood Sugar Levels in Diabetics. Unnes Journal of Public Health, 1(1). https://doi.org/10.15294/ujph.v1i1.178

[11] Notoatmojo, S. (2018). Health Research Methodology. Yogyakarta: Rineka Cipta.

[12] Pahlawati, A., & Nugroho, PS (2019). Relationship between Education Level and Age with Diabetes Mellitus Incidence in the Working Area of Palaran Health Center, Samarinda City in 2019. Borneo Student Research (BSR), 1(1), 1–5. http://journals.umkt.ac.id/index.php/bsr/article/view/479

[13] Paramitha, GM (2014). The Relationship of Physical Activity with Blood Sugar Levels in Type 2 Diabetes Mellitus Patients at the Karanganyar Regional General Hospital. Faculty of Medicine, Muhammadiyah University Surakarta, c, 1–43.

[14] Patima, N., Darwis, D., & Hasanuddin, H. (2019). The Effect of Prolanis Exercise on Reducing Blood Sugar Levels in Type 2 Diabetes Mellitus Patients in the Elderly at Binuang Health Center, Polman. Scientific Journal of Health Diagnosis, 14(4), 343–346. https://doi.org/10.35892/jikd.v14i4.287

[15] Perkeni, 2019. (2019). Guidelines for the management and prevention of type 2 diabetes

mellitus in adults in Indonesia 2019. Indonesian Endocrinology Association, 1–117. https://pbperkeni.or.id/wp-content/uploads/2020/07/Pedoman-Pengelolaan-DM-Type-2-Dewasa-di-Indonesia-eBook-PDF-1.pdf

[16] Prasetyani, D. (2017). Analysis of Factors Affecting the Incidence of Diabetes Mellitus (Dm) Type 2. Analysis of Factors Affecting the Incidence of Diabetes Miletus Type 2, 2(2), 1–9.

[17] R Puspitha, A., Erika, KA, & Saleh, U. (2020). Family Empowerment in Tuberculosis (TB) Treatment. Media Karya Kesehatan, 3(1), 50–58.

[18] Riskesdas. (2018). Riskesdas Report.

[19] RISKESDAS. (2018). Main Results of 2018 Basic Health Research.

[20] Susilawati, & Rahmawati, R. (2021). The Relationship Between Age, Sex and Hypertension With The Incidence Of Type 2 Diabetes Mellitus In Tugu Public Health. 6, 15–22.

[21] Sutanto. (2018). Diabetes, Detection, Prevention, Treatment. Yogyakarta: Smart Books.

[22] Syatriani, S. (2019). Relationship between work and family support with stress in type 2 diabetes patients in the coastal area of Makassar. Multidisciplinary Synergy of Science and Technology, 2, 26–27.

[23] WHO. (2019). Classification of diabetes mellitus. In Clinics in Laboratory Medicine (Vol. 21, Issue 1). https://doi.org/10.5005/jp/books/12855_84

[24] Xin Zheng, YQ (2020). Effects of Exercise on Blood Glucose and Glycemic Variability in Type 2 Diabetic Patients with Dawn Phenomenon. BioMed Research International, Volume 202.