KESANS: International Journal of Health and Science
e-ISSN: 2808-7178, p-ISSN: 2808-7380
Web: http://kesans.rifainstitute.com/index.php/kesans/index

The Effect of Walking Exercise Intervention on Blood Glucose Levels in Type 2 Diabetes Mellitus

Marcelina Bulan, Tini, Edi Purwanto
Nursing Student, Lecturer Major Nursing, Politeknik Kesehatan Kementerian Kesehatan Kalimantan Timur, Indonesia
cellinebulan383@gmail.com

Article Information
Submitted: **04 August 2023**
Accepted: **06 August 2023**
Online Publish: **20 August 2023**

Abstract
Introduction: *In 2021 people with Diabetes Mellitus at Work Area Dempar Public Health Center Dempar are still high, while patient visits to health services are still relatively low. Walking exercise is drug therapy and a healthy diet. Walking exercise performed 3-4 times a week with moderate intensity can rapidly increase the glucose transporter in skeletal muscle, so that fatty acid oxidation and glucose absorption will be accelerated.* ***Objective:*** *This study aims to identify the effect of programmed walking exercise on blood glucose levels in patients with type 2 Diabetes Mellitus.* ***Method:*** *This type of experimental research uses a quasi-experimental design without control with purposive sampling involving 11 respondents. Analysis of the data using the Reaped Measured ANOVA test.* ***Result and Discussion:*** *walking exercise 3 times a week there was a decrease in the average of the first week to the fourth week of 124 g/dl, p-value 0.000 (<0.05).* ***Conclusion:*** *that there is an effect of walking exercise on blood sugar of DM patients in the area of Dempar Public Health Center.*
Keywords: Walking Exercise; Blood Glucose; Diabetes Mellitus;

How to Cite **Marcelina Bulan, Tini, Edi Purwanto/ The Effect of Walking Exercise Intervention on Blood Glucose Levels in Type 2 Diabetes Mellitus, Vol. 2, No. 11, 2023**
DOI https://doi.org/10.54543/kesans.v2i11.217
e-ISSN/p-ISSN **2808-7178 / 2808-7380**
Published by **Rifa'Isntitute**

Introduction

Diabetes Mellitus is one of the four priorities of non-communicable diseases. As many as 1 in 2 people with Diabetes have not realized that they have Diabetes, where 80% of Diabetes events can be prevented. Diabetes can be controlled and sufferers can live a long and healthy life (Silalahi, 2019).

Data *International Diabetes Federation* (2017) shows DM worldwide is more than 352.1 million and it is predicted that by 2045 it will be 531.6 million people with Diabetes. The prevalence in Indonesia according to Riskesdas (2018) amounts to 2.0% of 264 million people. In 2018 East Kalimantan is one of the provinces in Indonesia that is included in the top 10 diabetics in the 7th order. Prevalence increased in 2014 by 1.3%, increasing in 2018 to 2.8%. Diabetes Mellitus prevalence rate in East Kalimantan province (Riskesdas, 2018).

Diabetes Mellitus is called with *The Silent Killer* (Anggoro, 2016). Diabetes Mellitus is a metabolic disorder disease in the pancreas organ that results in pancreatic beta cells cannot produce enough insulin effectively. Insulin is a hormone that regulates the balance of glucose levels, so there will be an increase in glucose in the blood or hyperglycemia (MOH, 2018). Diabetes is associated with food intake that affects the stability of blood sugar levels (LeMoene, P., Burke & Gerene, 2016).

Other factors that cause the risk of instability in blood glucose levels are non-adherence to the type, amount and hours (3J) of eating and lack of physical activity (Magdalena, 2016). Lifestyle change factors that lead to obesity due to overeating and relaxed living or lack of exercise (Wahyuni &; Alkaff, 2018) These factors triggered the findings of DM cases to date.

The number of people with Diabetes Mellitus based on the national prevalence rate of Diabetes Mellitus, which is 6.9% of the total population targeted by the district is 10,143 people (West Kutai Health Office, 2017). This means that the incidence of Diabetes Mellitus in West Kutai is still quite high so it requires effective and efficient handling.

The first step in the management of Diabetes is non-pharmacological management in the form of food planning and physical exercise (Listyarini &; Fadilah, 2017). Physical exercise or exercise is proven to increase the use of glucose by cells so that blood sugar levels drop (Rehmaita, Mudatsir, 2017). Exercise that can be done by people with high glucose levels can increase insulin sensitivity so that blood sugar decreases glucose levels faster (Hamonangan &; Easter, 2019).

Exercise in the form of exercise can decrease blood glucose in diabetic patients (Fauzi, 2015). *Exercise* The recommended ones to lower blood sugar are diabetic gymnastics and *Walking Exercise* (Damayanti, 2015). *Walking Exercise* is also an aerobic exercise that has a physiological effect on facilitating blood flow in the body (Shahar & Hamdy, 2015). *Walking Exercise* will trigger an increase in muscle work which will cause glucose uptake in the muscles to increase so that it can be used as an energy source (Proverawati &; Kusumawati, 2011).

The number of findings of type 2 Diabetes Miletus cases in the work area of the

Dempar Public Health Center was 89 cases in 2020. Hyperglycemia prevention activities in patients with type 2 Diabetes Mellitus have not run optimally. Intervention opportunities by providing intervention through *Walking Exercise intervention* by looking at efficiency and opportunities to be able to do Diabetes Mellitus patients at home independently.

Method

This study was conducted from April 1 to April 30, 2022 at the Dempar Public Health Center. This type of research is *Quasi Experimental* with *One-Group Pretest &; Posttest design.* The population of this study was 11 people in the working area of Dempar Public Health Center. Samples of all patients with type 2 DM were collected with *a total sampling* technique of 11 people. The method used in taking this study was carried out by looking at pre and post intervention data carried out 3 times a week for 1 month. The data collected were then analyzed univariately and bivariately. Statistical tests used with the *ANOVA Reaped Measures test.*

Result and Discussion

Result

Univariate Analysis

1. Characteristics of Respondents

The respondents aged 52 were 2 respondents (18.2%) and the female respondents were 9 respondents (81.8%)

Table 1
Characteristics of Respondents

Age	Frequency	Present (%)
31	1	9.1
33	1	9.1
42	1	9.1
46	1	9.1
47	1	9.1
52	2	18.2
53	1	9.1
56	1	9.1
58	1	9.1
62	1	9.1
Gender	**Frequency**	**Present (%)**
Man	2	18.2
Woman	9	81.8
Total	**11**	**100**

Source: Primary Data (2021)

2. Blood Sugar Analyst

The average blood sugar in the first week was 287 mg / dl, the measurement of the second week obtained an average blood sugar of 244 mg / dl in the 3rd week the average blood sugar was 211 mg / dl and the 4th week obtained an average blood sugar of 138 mg/dl

Table 2
Blood Sugar Variable Analysis

Variable	Mean	SD	Min-max
Week I	287	65.17	212-402
Week II	244	52.54	196-355
Week III	211	40.47	171-273
Week IV	138	28.53	101-186

Source: primary data

Analysis Bivariate

1. Data Normality Test

The results of standardized Residual for week I, standardized residual for week II and Standardized Residual for week IV with a value of > 0.05 mean that the data distribution is normal so that parametric tests can be carried out because the data is normally distributed

Table 3
Data Normality Test

Variable	N	*Shapiro wilk*
Standardized Residual for Week I	11	0.338
Standardized Residual for Week II	11	0.060
Standardized Residual for Week III	11	0.441
Standardized Residual for Week IV	11	0.635

Source: Primary Data, 2022

2. Paired T-Test

Indicates *a p value of* 0.001<0.05. This means that Ha is accepted that there is an effect *of walking exercise* on the blood sugar of type II diabetes patients at the Dempar Public Health Center

Table 4
The Effect of *Walking Exercise* on Blood Sugar

Within Subjects Effect	Mauchly's W	df	Itself
Time	**.094**	**5**	**.001**

Source: Primary Data, 2022.

Greenhouse-geisser *value;*1.325, *p-value* (0.000) <0.05, meaning that Ho was rejected and Ha accepted that there was a difference in blood sugar scores after being given *Walking Exercise* weeks on 1, 2, 3 and 4

Table 5
Blood sugar differences before and after *the Walking Exercise intervention*

Blood Sugar Levels	F	*p-value*
Week I	55.547	.000
Week II	55.547	.000
Week III	55.547	.000
Week IV	55.547	.000

Source: Primary Data, 2022.

The average decrease in blood sugar pre to the first week was 24.5 g / dl, week 1 to week two after the walking exercise *intervention* was 42.7 mg / dl. The average change in blood sugar from the second week to the third week after the intervention showed a decrease in blood sugar of 18.18 mg/dl. The average drop in blood sugar from week three to week four after the intervention showed a drop in blood sugar of 75.45 mg/dl

Table 6
Difference in Average Blood Sugar with *Walking Exercise*

Time	Time	Mean difference	*p-value*
pre	**Week 1**	**24.545***	**.001**
	Week 2	42.727*	.001
	Week 3	75.545*	.000
	Week 4	149.000*	.000
Week 1	**pre**	**-24.545***	**.001**
	Week 2	18.182	.055
	Week 3	51.000*	.001
	Week 4	124.455*	.000
Week 2	**pre**	**-42.727***	**.001**
	Week 1	-18.182	.055
	Week 3	32.818*	.002
	Week 4	106.273*	.000
Week 3	**pre**	**-75.545***	**.000**
	Week 1	-51.000*	.001
	Week 2	-32.818*	.002
	Week 4	73.455*	.001

Source: Primary Data, 2022.

Discussion

1. Characteristics of Respondents

The average age of respondents was 49 years in the middle adult category. Increasing age causes changes in carbohydrate metabolism and changes in insulin release so that the older a person is, the greater the incidence of Diabetes Mellitus (Smeltzer, 2013). Age is associated with a decrease in physiological functions of the body (Desita, 2019).

The respondents were female. Decrease in the hormone estrogen, especially during menopause. The hormones estrogen and progesterone can increase insulin response in the blood. When menopause occurs, the response to insulin decreases due to low estrogen and progesterone hormones (Kasana, 2017).

Other influential factors are women's body mass index which is often not ideal so this can reduce the sensitivity of insulin response. This is what makes women often affected by Diabetes than men (Rudi & Kwureh, 2017).

2. The Influence of Peer Educators on Healthy Food Behavior

Before the intervention *Walking Exercise* Average blood sugar 287 mg/dl. The increase in blood sugar levels is influenced by factors of age, gender, education, and length of suffering. High blood sugar levels before *Walking Exercise* Caused when the

body's activity is low, the use of glucose by the muscles will also decrease so that blood glucose levels exceed the body's ability to store then blood glucose will be higher than normal (Idris et al., 2014; Lisiswanti & Cordita, 2016; Shahar & Hamdy, 2015; Susanti et al., 2019).

The results of the intervention were seen in 1 month of the study in the fourth week obtained an average blood sugar of 138 mg / dl with a standard deviation of 28.5, the lowest value of 101 mg / dl and the highest 186 mg / dl. Changes in pre-week 1 blood sugar levels of 24.5 mg/dl. This change was only 24 mg / dl because the exercise carried out was still in the adaptation stage of respondents so it did not show a big change compared to other weeks.

From week 1 to week 2 showed a decrease in blood sugar of 42.73 mg/dl. If seen from respondents who intervened 3 times during 1 week showed blood sugar values when the highest in intervention 1 in the first week 402 mg / dl and the lowest 220 mg / dl, in the 2nd intervention blood sugar values when 387 mg / dl and the lowest 192 mg / dl, in the 3rd measurement blood sugar when the highest 377 mg / dl and the lowest 189 mg / dl. This means that it always has a significant decrease.

Changes in blood sugar measurement values during this time show a gradual decrease. If observed every *Walking Exercise activity,* all respondents followed the activity from the beginning to the end of the training session. Furthermore, there are no signs of contraindications such as fatigue in clients during training sessions. In line with the results of research conducted by Listyarini (2017) showed that most respondents in the intervention group experienced a significant decrease in blood sugar levels.

Blood sugar measurements during the 2nd week in 3 exercises showed a change in blood sugar values of 32.81 mg / dl. Changes in blood sugar scores in the second week were the least compared to changes in other measurements. This is because during the 2nd week there are several families who hold weddings. So many respondents do not pay attention to the food consumed. The results of research conducted by sitorus et al (2020) showed that there was a meaningful relationship between the amount of carbohydrate intake and blood sugar level control (Sitorus et al., 2020).

The amount of carbohydrates consumed from main meals and interludes is more important than the source of those carbohydrates. This is because the amount of carbohydrates consumed from main meals and interludes affects blood sugar levels and insulin secretion (Idris et al., 2014).

In line with Listyarini's research (2017) where in training sessions a small number of respondents experienced an increase in blood sugar levels. Meaningful influence between *Walking Exercise* program to changes in blood glucose levels in patients with type II Diabetes Mellitus (Isrofah et al., 2017). Previous supporting research conducted by Widiarto (2018) stated that *Walking Exercise* Can lower blood pressure in people with high blood pressure, this exercise can also reduce plaque formation caused by fat and glucose in the body (Widiarto, 2018).

The results of the study are of the opinion that nurses have an educational role in the educational process for type II Diabetes Mellitus patients when carrying out treatment management, so non-pharmacological companion therapies such as *Walking* exercise so that blood sugar levels can be controlled. In doing *Walking Exercise* Recommended for moderate intensity (Perkeni, 2020). *Walking Exercise* This is a physical activity that is very easy to do independently and in groups, effective, inexpensive and can be done anywhere.

Conclusion

The *p value is* 0.001<0.05. This means that Ha is accepted that there is an effect *of walking exercise* on the blood sugar of type II diabetes patients at the Dempar Public Health Center. While the difference in blood sugar shows a *p-value* (0.000) <0.05, meaning that Ho is rejected and Ha is accepted that there is. While the greenhouse-Geisser value is 0.000<0.05, meaning that Ho is rejected and Ha is accepted that there is a significant blood sugar lowering effect on average blood sugar decline in the first, second, third and fourth weeks.

It is expected that *the walking exercise module* as a reference for teaching materials in providing information related to the effect of *Walking Exercise* on blood sugar levels in Diabetes Mellitus patients. Research on *Walking Exercise* and blood sugar levels in Diabetes Mellitus patients should be carried out to a larger number of people, and in different locations and has never been done about this study

References

Anggoro, S. D. (2016). *Perancangan Buku Ilustrasi Pencegahan Diabetes Sejak Dini*. Institut Seni Indonesia Yogyakarta.

Damayanti, S. (2015). Diabetes Mellitus & Penatalaksanaan Keperawatan. In *Nuha medika* (p. 146).

Depkes, R. I. (2018). Pengertian Diabetes Mellitus. *Jakarta: Departemen Kesehatan Republik Indonesia*.

Desita, Y. P. (2019). *Pengaruh Walking Exercise Terhadap Perubahan Kadar Glukosa Darah Pada Penderita Diabetes Mellitus Tipe 2 Dengan Pendekatan Theory Of Planned Behavior Di Desa Banjardowo Kabupaten Jombang*. STIKes Insan Cendekia Medika Jombang.

Dinkes Kutai Barat. (2017). *Laporan Kasus Panyakit DM di Kutai Barat tahun 2016*. UNIVERSITAS HASANUDDIN.

Fauzi, L. (2015). Intensitas Jalan Kaki Terhadap Penurunan Kadar Glukosa Darah. *KEMAS: Jurnal Kesehatan Masyarakat*, *8*(2), 106–112. https://doi.org/10.15294/kemas.v8i2.2633

Hamonangan, D., & Paskah, R. (2019). *Pengaruh jalan cepat terhadap penurunan gula darah pada pasien DM tipe 2 yang berobat jalan di Rumah Sakit Umum Imelda Pekerja Indonesia (RSU IPI) Medan. 5*(2), 629–634.

Idris, A. M., Jafar, N., & Indriasari, R. (2014). Pola makan dengan kadar gula darah pasien DM tipe 2. *Media Kesehatan Masyarakat Indonesia*, *10*(4), 211–218.

Isrofah, I., Nurhayati, N., & Angkasa, P. (2017). Efektifitas Jalan Kaki 30 Menit Terhadap Nilai Gula Darah Pada Pasien Diabetes Mellitus Tipe II Di Desa Karangsari Kecamatan Karanganyar Kabupaten Pekalongan. *Journal of Holistic Nursing Science*, *4*(1), 16–24.

Kasana, R. U. (2017). *Hubungan Antara Self Awareness Dengan Kadar Glukosa Darah Pada Pasien Dm Tipe 2(Di Poli Penyakit Dalam RSUD Jombang)*. STIKES Insan Cendekia Medika Jombang.

LeMoene, P., Burke, K. M., & Gerene, B. (2016). Buku Ajar Keperawatan Medikal Bedah. In *EGC* (2nd ed., Vol. 8, Issue 2).

Lisiswanti, R., & Cordita, R. N. (2016). Aktivitas fisik dalam menurunkan kadar glukosa darah pada diabetes melitus tipe 2. *Majority*, *5*(3), 140–144.

Listyarini, A. D., & Fadilah, A. (2017). Brisk Walking Dapat Menurunkan Kadar Glukosa Darah Pada Penderita Diabetes Mellitus Di Desa Klumpit Kecamatan Gebog Kabupaten Kudus. *Jurnal Keperawatan Dan Kesehatan Masyarakat Cendekia Utama*, *6*(2), 10–19.

Magdalena, C. (2016). Aktivitas Fisik Terhadap Status Kadar Gula Darah Pada Penderita Diabetes Mellitus Tipe 2 Di Posbindu Wilayah Kerja Puskesmas Ciputat Tahun 2016. *Jurnal Kependidikan Islam*, *2*, 12–23.

Perkeni. (2020). Panduan Pelaksanaan DM Tipe 2 pada Individu Dewasa. *Jurnal Ilmiah Kesehatan Karya Putra Bangsa*, *2*(2), 51–55.

Proverawati, & Kusumawati. (2011). Ilmu Gizi untuk Keperawatan dan Gizi Kesehatan. In *Nuha Medika* (Vol. 2, Issue 1).

Rehmaita, Mudatsir, T. T. (2017). Pengaruh Senam Diabetes Dan Jalan Kaki Terhadap Penurunan Kadar Gula Darah Pada Pasien Dm Tipe II Di Puskesmas Krueng Barona Jaya Aceh Besar. *Jurnal Ilmu Keperawatan*, *5*(2), 84–89.

Riskesdas. (2018). Hasil utama RISKESDAS 2018. *Jakarta Badan Penelit Dan Pengemb Kesehatan, Kementrian Kesehat Republik Indones*.

Rudi, A., & Kwureh, H. N. (2017). *Faktor risiko yang mempengaruhi kadar gula darah puasa pada pengguna layanan laboratorium*.

Shahar, J., & Hamdy, O. (2015). Medication and exercise interactions: Considering and managing hypoglycemia risk. *Diabetes Spectrum*, *28*(1), 64–67. https://doi.org/10.2337/diaspect.28.1.64

Silalahi, L. (2019). Hubungan Pengetahuan dan Tindakan Pencegahan Diabetes Mellitus Tipe 2. *Jurnal Promkes: The Indonesian Journal of Health Promotion and Health Education, 7(2), 223-232.*, *7*(2), 56. https://doi.org/10.30602/pnj.v1i2.288

Sitorus, C. E., Mayulu, N., & Wantania, J. (2020). Hubungan Konsumsi Fast Food, Makanan/Minuman Manis dan Aktifitas Fisik Dengan Kadar Gula Darah Dan Status Gizi Mahasiswa Fakultas Kedokteran Universitas Sam Ratulangi. *Indonesian Journal of Public Health and Community Medicine*, *1*(4), 10–17.

Smeltzer, S. C. (2013). *Keperawatan medikal bedah brunner & suddarth*.

Susanti, E. F., Nur, H., & Dian. (2019). *Gambaran faktor risiko terjadinya diabetes melitus pada penderita diabetes melitus tipe 2*. Universitas Muhammadiyah Surakarta.

Wahyuni, S., & Alkaff, R. N. (2018). Diabetes Mellitus pada Perempuan Usia Reproduksi di Indonesia Tahun 2017. *Indonesian Journal of Reproductive Health*, *3*(1), 46–51.

Widiarto, A. (2018). *Pengaruh Brisk Walking Excercise Terhadap Tekanan Darah Penderita Hipertensi di Desa Sengon, Wilayah Kerja Puskesmas Jabon*. STIKes Insan Cendekia Medika Jombang.