



## Differences in Blood Sugar Levels Before and After Morning and Afternoon Walk in Type II Diabetes Melitus Patients at Babakansari Puskesmas

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### Abstract

Diabetes Mellitus (DM) is a non-communicable disease which causes an increase in blood sugar levels and is at risk of causing disease complications. Walking is done to increase the sensitivity of insulin receptors. Blood vessels in the afternoon are more vasodilated than in the morning due to the effects of circadian rhythms which affect hormone action. This study aims to determine the difference in the average value of blood sugar levels before and after walking in the morning and afternoon in patients with type II DM. The research design used was a pre- experiment with a pretest-posttest two group design approach. The sample of 20 respondents who are divided into 2 groups, namely the morning group of 10 people and the afternoon group of 10 people, with purposive sampling. The results of this study showed that the amount of decrease in blood sugar levels in the morning group was 31.6 mg/dL and the amount of decrease in blood sugar levels in the afternoon group was 43.5 mg/dL. The results of statistical tests in the morning group obtained a value of  $p = 0.007$  ( $p < 0.05$ ) and in the afternoon group obtained a value of  $p = 0.005$  ( $p < 0.05$ ). The results showed that the afternoon group was more effective in reducing average blood glucose levels as a result of vasodilatation of blood vessels which is influenced by circadian rhythms compared to the morning group, so it can be concluded that there are differences in blood sugar levels before and after walking in the morning and in the afternoon in patients with type II DM. Therefore it is advisable to walk, especially in the afternoon which can lower blood sugar levels more for type II DM sufferers in an effort to control blood sugar levels

*Keywords:* Afternoon, Diabetes Mellitus, Blood Sugar Levels, Morning, Walking

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### 1. Introduction

Riskesdas 2018 shows that the prevalence of DM in Indonesia based on doctor's diagnosis at the age of  $\geq 15$  years is 2%, this figure shows an increase when compared to the results of Riskesdas 2013 of 1.5%. The increase in the prevalence of DM disease is thought to be related to changes in people's lifestyles such as diet, which is a high-calorie diet without being balanced with exercise activities that are at risk of insulin resistance

According to Ilyas, one way to control diabetes mellitus is with physical exercise, physical exercise is an exercise that can cause an increase in blood flow, more capillaries open so that more insulin receptors are available and receptors become more active which will have an impact on lowering blood glucose in diabetic patients (Andersen et al., 2021).

One of the physical exercises that is often used in reducing blood sugar levels in people with diabetes mellitus is walking. Walking is a simple exercise that cannot trigger excessive fatigue, has the lowest risk of injury and has a positive effect on insulin resistance. Walking done regularly, 3-4 times a week for approximately 30 minutes can improve fat profile, lose weight, maintain fitness and increase insulin sensitivity so that it will reduce blood glucose (Bastaki, 2005)

The results of Kim et al. (2019) showed that the average decrease in blood sugar levels by walking was 50 mg/dl. This is supported by the results of Forlenza et al. (2018) It was found that there was a significant effect on reducing blood sugar levels in type II diabetes mellitus patients who did diabetic gymnastics ( $p - value = 0.002$ ) and walking ( $p - value = 0.001$ ). The results of Hayashi et al. (2013) found that there were no differences in light intensity aerobic exercise in the morning and evening on blood sugar levels in wistar rats with obesity.

A different study from the previous one conducted is the effect of the body's circadian rhythm on aerobic exercise that can affect blood circulation. Previous research on aerobic exercise with circadian rhythm effects was conducted

on obese Wistar rats. Blood circulation is influenced by circadian rhythms, which are biological rhythms that affect changes both neurologically and hormonally. In humans, the effect of circadian rhythms on exercise will be effective in the afternoon where nerves begin to have an impact on blood vessels until vasodilation and the effect of the hormone ACTH decreases (Baschieri & Cortelli, 2019).

The results of the preliminary study at UPT Puskesmas Babakansari, the results of interviews with 17 out of 43 people with diabetes mellitus, the average fasting blood sugar level last month was  $> 130$  mg / dl and some even had blood sugar levels reaching 450 mg / dl. According to the respondents, for food diets, they already know and can control it, to take oral antidiabetic drugs regularly every time, but for exercise is not routinely done, only doing exercise when attending prolanis activities once a month and their blood sugar levels still experience ups and downs not yet stable. In addition, in prolanis activities, Babakansari Health Center has often conducted counseling.

## 2. Literature Review

Diabetes mellitus (DM) is a non-communicable disease that causes carbohydrate metabolism disorders due to the body's inability to produce the hormone insulin or due to inactive use of insulin production so that glucose cannot enter the cells even though glucose is present in the cells (Wagner & Brath, 2012). This process will cause an increase in blood sugar levels in DM patients. Therefore, there needs to be an effort to reduce or stabilize high blood sugar levels by doing 4 pillars consisting of counseling, food planning, physical exercise and drugs to reduce blood sugar levels (oral antidiabetic drugs and insulin therapy) (Black & Hawks, 2014). One way to control diabetes mellitus with blood sugar control is by physical exercise. Physical exercise that is recommended for people with diabetes mellitus is aerobics which consists of walking, jogging, cycling, gymnastics, dance, swimming, tennis and golf (Bhaskarabhatla & Birrer, 2005). Walking is a simple exercise that cannot trigger excessive fatigue, has the lowest risk of injury and has a positive effect on insulin resistance so that it can reduce or stabilize blood sugar levels (Van den Berghe, 2004). This decrease in blood sugar levels occurs because when walking is done there will be contractions between skeletal muscles that can affect the increase in insulin's ability to activate sugar transport to the muscles resulting in the metabolism of muscle work through insulin-independent pathways so that there is a decrease in plasma glucose levels. Muscles also experience additional adaptations in the form of the synthesis of hexokinase needed for glucose absorption, gene transcription occurs to produce hexokinase II so that insulin increases, glucose is transported to cells, blood sugar levels decrease and energy is produced (Gulve, 2008).

In the liver insulin becomes more sensitive, as a result some of the glucose is taken up by the liver and glycogenesis occurs. Glucose that has previously been converted and stored in the liver as glycogen, is converted back into glucose and sent to the muscles. In the muscles, glucose is broken down to produce ATP, which is the source of fuel for the muscles. Walking in clients with Type II DM has an effect on glycemic control. One of the beneficial effects of exercise on glucose balance is characterized by stimulation of blood glucose utilization during and after exercise (Gulve, 2008). Walking done regularly, 3-4 times a week for approximately 30 minutes can improve fat profile, lose weight, and maintain fitness. Walking is not only useful for fitness, but it is also important for weight loss, improving insulin sensitivity, which will reduce blood glucose (Colberg et al., 2016).

The results on the Effect of Physical Exercise Walking on Decreasing Blood Sugar Levels in Type 2 Diabetes Mellitus Patients by walking 3 times a week for 30 minutes from March 27 to April 15 with a rhythm of 100 steps per minute which is preceded by 5 minutes of warm-up and ends with 5 minutes of cooling show the results there is an average decrease in blood sugar levels by walking is 50 mg/dl. The statistical test results obtained a value of  $p = 0.000$  ( $p < 0.05$ ) which means that it can reduce blood sugar levels in Type II DM patients (Kasmad et al., 2022).

The results on the Effect of Walking and Foot Gymnastics on Blood Glucose Levels of Type 2 Diabetes Mellitus Patients based on the results of the Wilcoxon test on acute effects (before and after exercise) walking obtained a  $p$  value = 0.005 and foot gymnastics with a  $p$  value = 0.005. While the chronic effect (before and after 4 weeks of exercise) walking obtained a  $p$  value = 0.092 and foot exercises with a  $p$  value = 0.24. From the results of the mann whitney test, the  $p$  value of the acute effect = 1.000 and the  $p$  value of the chronic effect = 0.85 (Biadgo et al., 2017).

The results on the Effect of Leisure Walking on Blood Glucose Levels in Patients with Type 2 Diabetes Mellitus with sampling done by purposive sampling. Leisurely walking activities are carried out as far as 2 km with a travel time of 30 minutes. The results of the statistical test of the difference in glucose results of  $p < 0.001$  which indicates that the results are significant or meaningful and have a correlation value of 0.963 which indicates a very strong influence. This study concludes that leisurely walking exercise as far as 2 km for 30 minutes can significantly reduce blood glucose levels in patients with diabetes mellitus (Gikas et al., 2009).

The results of research on the intensity of walking on blood sugar levels showed that there was a difference between walking with moderate ( $p = 0.001$ ) and high intensity ( $p = 0.001$ ) to reduce blood glucose levels in mild DM patients (blood glucose levels at  $< 250$  mg/dl). The conclusion of the study is that there is a difference between walking with moderate and high intensity on reducing blood glucose levels in patients with mild DM (Saito et al., 2011).

The results was found no difference in light intensity aerobic exercise in the morning and evening on blood sugar levels in Wistar rats with obesity. This study was not conducted on DM rats, but was conducted on obese strains of rats and has involved the effects of circadian rhythms in its research (Shi et al., 2013).

### 3. Materials and Methods

#### 3.1. Materials

The population in this study were all patients with type 2 diabetes mellitus who routinely attended prolanis activities at the Babakansari Health Center as many as 43 respondents. The sampling technique used in this study was purposive sampling. The inclusion criteria (Patients can do walking activities, willing to become respondents, diabetes mellitus without complications of other diseases)

Samples that met the inclusion criteria were 20 out of 43 patients with type 2 diabetes mellitus who met the inclusion and exclusion criteria. The 20 samples were divided into 2 groups, namely 10 people in the morning group and 10 people in the afternoon group. The method of grouping respondents who do morning and afternoon walks is that when doing inform consent the researcher proposes options to respondents who are willing to walk in the morning or in the afternoon.

Instruments in the study used:

1) Walking Instrument

The walking instrument uses a stopwatch to time the walk.

2) Blood Glucose Level Instrument

The instrument used to measure blood glucose levels is the Easy Touch GCU brand glucometer that has been calibrated, as a measuring instrument to measure blood glucose levels. The measurement results are read on the glucometer within 10 seconds.

#### 3.2. Methods

Data analysis is a process of simplifying data into a form that is easier to read and easier to interpret.

1) Univariate Analysis

Univariate analysis was carried out on each variable from the results of the study. In this study only wanted to see the average value of pre-test and post-test blood sugar levels after walking in the morning group and see the average value of pre-test and post-test blood sugar levels after walking in the afternoon group. Next, make an average of the data from the measurement of *pre-test* and *post-test* blood sugar levels using the formula:

$$\frac{\sum_{i=1}^n X_i}{n} \quad (1)$$

Description:

$\bar{X}$  : Mean

$\sum_{i=1}^n X_i$  : Sum of all data values

$n$  : Total number of frequencies (Supangat, 2010)

To determine the percentage in this study is:

$$P \frac{x}{n} \times 100\% \quad (2)$$

Description:

$P$  : Percentage

$x$  : Number of type 2 DM patients who fit the criteria

$n$  : Number of samples

In this study, bivariate was used to see the difference between blood glucose levels before intervention and after morning and evening interventions. The purpose of this test is to see blood glucose levels in patients with type 2 diabetes mellitus.

Researchers conducted a data normality test with Shapiro-Wilk because the number of samples was 20 people with the following formula:

$$T^3 = \frac{1}{D} \left[ \sum_{i=1}^K \alpha_1 (X^{n-i_1} - X^{(i)}) \right]^2 \quad (3)$$

$$D = \frac{1}{D} \sum_{i=1}^K \alpha_1 (X_i - \bar{x})^2 \quad (4)$$

Description:

$D$  : Denominator of the test statistic

$T$  : Test statistic

$\alpha_1$  : Value listed in table A17 (Coefficient for Shapiro-Wilk test)

$\bar{x}$  : Average of X scores

$X_i$  : Observation i

$X_{(i)}$  : X ith order (Linden, (2013).

From the results of the *Shapiro-Wilk* test, the p value of the morning group pre-test was  $0.269 > 0.05$ , the morning group post-test was  $0.183 > 0.05$ , the afternoon group pre-test was  $0.642 > 0.05$  and the afternoon group post-test was  $0.519 > 0.05$  so that the data was normally distributed, so the researchers analyzed the data using the *Paired sample T-test* (paired T test) to conduct a comparative test between two conditions (problems) with the following formula:

$$t = \frac{X_1 - X_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2} - 2r\left(\frac{S_1}{\sqrt{n_1}}\right)\left(\frac{S_2}{\sqrt{n_2}}\right)}} \quad (5)$$

Description:

$X_1$  : Average of sample 1

$X_2$  : Sample mean 2

$S_1$ : Standard deviation of sample 1

$S_2$  : Standard deviation of sample 2

$S_1^2$  : Variance of sample 1

$S_2^2$  : Sample variance

$2r$  : Correlation between the two samples (Hanusz et al., 2016)

## 4. Results and Discussion

### 4.1. Results

The results of the study Differences in Blood Sugar Levels Before and After Morning and Afternoon Walking in Patients with Type 2 Diabetes Mellitus at UPT Puskesmas Babakansari Bandung City. The sample was 20 people, 10 people in the morning group and 10 people in the afternoon group who suffered from type 2 diabetes mellitus who participated in prolanis activities according to the inclusion and exclusion criteria at UPT Puskesmas Babakansari, as for the research results as follows.

#### 4.1.1. Univariate Analysis

- 1) The average value of blood sugar levels before and after the morning group walk in type 2 diabetes mellitus patients can be seen in Table 1 frequency distributionas follows:

**Table 1:** Frequency Distribution of Average Blood Sugar Levels Before and After Walking in the Morning Group in Patients with Type 2 Diabetes Mellitus at UPT Puskemas Babakansari Bandung City

Blood Sugar Levels	Average
Morning Pre-test	228.9
Morning Post-test	197.3
Total Decrease	31.6

From table 1, it can be seen that the average value of blood sugar levels before walking is 228.9 and after walking 197.3 with a total decrease of 31.5 in the morning group of patients with type 2 diabetes mellitus.

- 2) The average value of blood sugar levels before and after walking in the afternoon groupin patients with type 2 diabetes mellitus can be seen in Table 2 frequency distributionas follows:

**Table 2:** Frequency Distribution of Average Blood Sugar Levels Before and After Walking in the Afternoon Group in Patients with Type 2 Diabetes Mellitus at UPT Puskemas Babakansari Bandung City

Blood Sugar Levels	Average
Afternoon Pre-test	256
Afternoon Post-test	212.5
Total Decrease	43.5

From table 2, it can be seen that the average value before walking was 256 and after walking was 212.5 with a total decrease of 43.5 in the afternoon group of patients with type 2 diabetes mellitus.

#### 4.1.2. Bivariate Analysis

To determine the difference in the average value of blood sugar levels before and after walking in the morning and evening groups in patients with type 2diabetes mellitus at the Babakansari Health Center, Bandung City, a paired samplesT-test was conducted. The following will be presented in Table 3 as follows:

**Table 3:** Differences in Mean Blood Sugar Levels Before and After Morning and Afternoon Walking in Patients with Type 2 Diabetes Mellitus at UPT Puskemas Babakansari Bandung City

Paired Samples Test			
Paired Differences	Mean	t	Sig. (2-tailed)
Morning group <i>pre-test</i> and <i>post-test</i>	31.6	3.462	0.007
<i>Pre-test</i> and <i>post-test</i> of the afternoon group	43.5	3.758	0.005

Based on statistical tests in table 3 above with Paired Sample T-Test (paired), the pre-test and post-test results of the morning group walk obtained a sig value. (2- tailed) of 0.007 < 0.05, while in the pre-test and post-test results of the afternoon group walk, the sig. (2-tailed) of 0.005 < 0.05, it can be concluded that there is a significant difference between the results of the pre-test and post-test of the morning group walk and the pre-test and post-test of the afternoon group walk in patients with type 2 diabetes mellitus at UPT Puskesmas Babakansari Bandung City.

The discussion in this study consists of the average value of blood sugar levels before and after morning walks in patients with type 2 diabetes mellitus at Babakansari Health Center, the average value of blood sugar levels before and after afternoon walks in patients with type 2 diabetes mellitus at Babakansari Health Center, and the difference in the average value of blood sugar levels before and after morning and afternoon walks in patients with type 2 diabetes mellitus at Babakansari Health Center.

## 4.2. Discussion

### 4.2.1. Overview of Mean Blood Sugar Levels Before and After Walking in the morning Patients with Type 2 Diabetes Mellitus

Based on the analysis of table 1 above shows that the average value of blood sugar levels before walking is 228 and after walking is 197.3 with a total decrease in blood sugar levels of 31.6 in patients with type 2 diabetes mellitus. Based on the theory that states that the decrease in blood sugar levels occurs because when walking is done because there will be contractions between skeletal muscles that can affect the increase in insulin's ability to activate sugar transport to the muscles resulting in the metabolism of muscle work through insulin-independent pathways so that there is a decrease in plasma glucose levels. Muscles also experience additional adaptations in the form of the synthesis of hexokinase needed for glucose absorption, gene transcription occurs to produce hexokinase II so that insulin increases, glucose is transported to cells, blood sugar levels decrease and energy is produced (Gulve, 2008)

Walking in clients with Type II DM has an effect on glycemic control. One of the beneficial effects of exercise on glucose balance is characterized by stimulation of blood glucose utilization during and after exercise (Gulve, 2008). Walking done regularly, 3-4 times a week for approximately 30 minutes can improve fat profile, lose weight, and maintain fitness. Walking is not only useful for fitness, but it is also important for weight loss, improving insulin sensitivity, which will reduce blood glucose (Ahmed et al., 2013)

Based on the results of the study of 10 patients, there were 9 patients experiencing a decrease in blood sugar levels, namely most (90%), this could occur because in the process of implementing walking the patient followed the activities according to the procedures set by the researcher such as the length of the walking process for 30 minutes, while a small proportion (10%) experienced an increase in blood sugar levels. This can occur because the patient in the process of implementing the walk does not follow the procedures set by the researcher such as in the middle of the walking activity stops a lot so as not to carry out the walk for 30 minutes according to the predetermined time and the patient also says that it has been 2 months since taking medicine and does not carry out the recommended food diets.

The increase in blood sugar levels can occur because based on the theory that there are several factors that affect blood sugar levels, one of which is consuming too much carbohydrates. Consuming too many carbohydrates in food will be absorbed in the bloodstream in the form of glucose monosaccharide. Other types of sugar will be converted by the liver into glucose, so when consuming too much carbohydrate, there will also be a lot of glucose produced in the blood. Therefore, carbohydrates can affect blood glucose levels (Kasmad et al., 2022).

Most of the blood sugar levels in patients with type 2 diabetes mellitus who follow prolanis still experience ups and downs even though gymnastic activities have been implemented during prolanis. This can happen because based on the results of interviews, patients only do physical exercise during prolanis activities and never do physical exercise independently. With the results of this study showing that walking is one of the factors that can reduce blood sugar levels, it is hoped that patients with type 2 diabetes mellitus will walk every day for 30 minutes in their respective homes without reducing drug consumption and continuing to carry out food diets as recommended.

This is in line with the results on the Effect of Physical Exercise Walking on Decreasing Blood Sugar Levels in Type 2 Diabetes Mellitus Patients by walking 3 times a week for 30 minutes from March 27 to April 15 with a rhythm of 100 steps per minute which is preceded by 5 minutes of warm-up and ends with 5 minutes of cooling showing the results there is an average decrease in blood sugar levels by walking is 50 mg/dl. The statistical test results obtained a

value of  $p = 0.000$  ( $p < 0.05$ ) which means that it can reduce bloodsugar levels in Type II DM patients (Wagner & Brath, 2012).

#### 4.2.2. Overview of Average Blood Sugar Levels Before and After Walking in the Afternoon in Patients with Type 2 Diabetes Mellitus

Based on the analysis of table 2 above shows that the average value of blood sugar levels before walking is 256 and after walking is 212.5 with a decrease in blood sugar levels by 43.5 in patients with type 2 diabetes mellitus. Blood circulation is influenced by circadian rhythms, which are biological rhythms that affect both neural and hormonal changes. In humans, the effect of circadian rhythms on exercise will be effective in the afternoon where nerves begin to impact blood vessels to vasodilatation and the effect of the hormone ACTH decreases (Biadgo et al., 2017).

This is in line with the theory of which states that the right time to exercise is at 16.00 because the adrenaline hormone and body temperature are in a state of decline. This hour also the lungs function optimally. Based on the results of research from 10 patients, there are 9 patients experiencing a decrease in blood sugar levels, namely most (90%) this can occur because in the process of implementing walking, patients follow activities according to procedures set by researchers such as the length of the walking process for 30 minutes, while a small proportion (10%) experience an increase in blood sugar levels. This can occur because based on the results of the interview, the patient is taking steroid drugs to cure his rheumatism, besides that the patient said he was stressed due to family problems.

The occurrence of an increase in blood sugar levels in these respondents is because based on the theory that states there are several factors that affect blood sugar levels, one of which is taking various drugs including antipsychotic drugs and steroids. Atypical antipsychotic drugs have side effects on metabolism and steroid side effects on increasing carbohydrate, protein and chewing metabolism. Synthetic steroids have the same mechanism of action as the body's natural steroids. Stress can also affect blood sugar levels both physical and neurogenic stress, will stimulate the release of ACTH from the anterior pituitary gland. Furthermore, ACTH will stimulate the adrenal glands to release adrenocorticoids, namely cortisol. This cortisol hormone will then cause an increase in blood glucose levels. Another factor that causes increased blood sugar levels due to taking steroids, the ACTH hormone in the afternoon decreases so that the effect on blood vessels is vasocontracted which can cause decreased blood flow, which causes a decrease in insulin receptor sensitivity to blood sugar levels (Kim et al., 2019)

#### 4.2.3. Differences in Blood Sugar Levels Before and After Morning and Afternoon Walking in Patients with Type 2 Diabetes Mellitus

Judging from table 3, the results of this study indicate that there are differences in blood sugar levels before and after morning and afternoon walks in patients with type 2 diabetes mellitus with the results of paired sample T-test paired obtained sig value. (2-tailed) of  $0.007 < 0.05$  in the morning group, and sig. (2-tailed) of  $0.005 < 0.05$  in the afternoon group. This means that there is a significant difference between the results of the pre-test and post-test of the morning group walk with the *pre-test* and *post-test* of the afternoon group walk in patients with type 2 diabetes mellitus at UPT Puskesmas Babakansari Bandung City, so  $H_0$  is rejected. The results of the study showed a difference in the value of blood sugar levels between the morning group of 31.6 mg/dL and the afternoon group of 43.5mg/dL, so there was a greater reduction in blood sugar levels in the afternoon group.

Based on the theory, this happens because blood circulation is influenced by circadian rhythms, namely biological rhythms that affect changes both neurologically and hormonally. In humans, the effect of circadian rhythms on exercise will be effective in the afternoon where the nerves begin to have an impact on blood vessels to vasodilate and the effect of the hormone ACTH decreases, then blood circulation will be smooth and glucose can enter the cells (Van den Berghe, 2004). In addition, in the morning the blood vessels are still in a state of vasoconstriction, so they must first warm up so that the blood vessels experience vasodilation and smooth blood circulation that can facilitate the distribution of blood containing oxygen and glucose into the cells.

This is in line with the theory of Gikas et al., (2009) which states that the right time to exercise is at 16.00 because the adrenaline hormone and body temperature are in a state of decline. This hour also the lungs function optimally. Glucose that has previously been converted and stored in the liver as glycogen, is converted back to glucose and sent to the muscles. In the muscles, glucose is broken down to produce ATP, which is the fuel source for the muscles. Walking in clients with Type II DM has an effect on glycemic control. One of the beneficial effects of exercise on glucose balance is characterized by stimulation of blood glucose utilization during and after exercise (Gulve, 2008)

There are several factors that can affect blood sugar levels, one of which is physical activity. Physical activity affects blood glucose levels, because when body activity is high, glucose utilization by muscles will increase. Endogenous glucose synthesis will be increased to keep blood glucose levels in balance. One part of physical activity that can reduce and stabilize blood sugar levels in patients with type 2 diabetes mellitus is physical exercise. In line with the theory put forward by (Bhaskarabhatla & Birrer, 2005). which states that the effect of physical exercise in patients with type 2 diabetes mellitus is that it can help launch disturbed carbohydrate metabolism, so that the accumulation of sugar in the blood can be reduced and can improve glucose tolerance and reduce the need for insulin. One of the physical exercises that is often used in reducing blood sugar levels in patients with diabetes mellitus

is walking. Walking is a simple exercise that cannot trigger excessive fatigue, has the lowest risk of injury and has a positive effect on insulin resistance (Shi et al., 2013).

In accordance with the results of research that has been done, that there are many factors that can affect blood sugar levels but not all of these factors can immediately show changes and can last long. Physical exercise is one of the factors that can directly show changes in blood sugar levels, as evidenced by the results of 9 out of 10 respondents experiencing a significant decrease in blood sugar levels.

Based on the research that has been done, it is found that in respondents who do walking there is a decrease in blood sugar levels that are different in each respondent. This is in accordance with Van den Berghe, (2004). that the decrease in blood sugar levels is different for each respondent. Each research subject will be in control of himself, which is what causes differences in changes in blood sugar levels. In this study, respondents' control of the walking movement in each individual will vary. This will have a different effect on changes in blood sugar levels of each respondent.

## 5. Conclusion

There is a difference in the average value of blood sugar levels before and after morning and evening walks in patients with type 2 diabetes mellitus at UPT Puskesmas Babakansari Bandung City with a sig value. (2-tailed) of  $0.007 < 0.05$  in the morning group, and sig. (2-tailed) of  $0.005 < 0.05$  in the afternoon group. In addition, there is a decrease in blood sugar levels in the morning group by 31.6 and there is a decrease in blood sugar levels in the afternoon group. The afternoon group was 43.5 in patients with type 2 diabetes mellitus, from the total decrease in blood sugar levels in the morning and afternoon groups, there was a greater decrease in the afternoon group.

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