
The Relationship Between Physical Activity and Body Mass Index with Blood Glucose Levels in Damri Bus Drivers in Bandung City 2023

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Abstract

Introduction: Diabetes mellitus (DM) became a disease in 463 million people aged 20-79 years in the world in 2019. Indonesia ranks 7th in the world with type 2 diabetes mellitus with around 10.7 million people. Diabetes occurs due to an imbalance in blood glucose levels with blood glucose test results of more than 200 mg/dl. The profession with the highest risk of type 2 diabetes mellitus is bus drivers. Bus drivers have unhealthy lifestyles such as smoking, high sugar consumption lack of physical activity and high body mass index are risks of diabetes mellitus. This study uses physical activity and body mass index with blood glucose levels to determine whether or not there is a relationship by checking blood glucose during DAMRI bus drivers.

Methodology: The research method used an observation approach or data collection at one time with a cross-sectional design. The sample in the study was DAMRI bus drivers in the pool of Kebon Kawung Bandung city, with as many as 50 people. The sampling method uses a total sampling technique. Data analysis was done with univariate frequency distribution and bivariate chi-square test. **Research findings:** The results showed that there was a relationship between physical activity and blood glucose levels, namely p value $0.004 < 0.05$, and there was a relationship between body mass index and blood glucose levels, namely p value $0.019 < 0.05$. These results indicate that there is a relationship between physical activity and body mass index with blood glucose levels. **Conclusions:** It is expected that health workers, especially nurses, can provide health services both counseling and renewal in collaboration with companies to be able to improve the provision of health services.

Keywords: Physical Activity, Body Mass Index, Blood Glucose Levels, Adults

1. Introductions

Diabetes mellitus (DM) became a disease in 463 million people aged 20-79 years in the world in 2019. Indonesia ranks 7th in the world with type 2 diabetes mellitus around 10.7 million people and ranks 3rd in the Southeast Asian region with a prevalence spread of 11.3%. Indonesia also faces a diabetes threat situation the

International Diabetes Federation (IDF) reported that diabetes mellitus in Indonesia still shows an increasing trend^[1].

Diabetes mellitus is a chronic disease in the form of a metabolic disorder characterized by blood glucose levels exceeding normal limits. Type 2 diabetes mellitus is a disease caused by a decrease in low insulin

secretion by the pancreas gland which occurs mostly in individuals aged 35 years and over due to an unhealthy lifestyle that increases blood glucose levels. The cause of diabetes mellitus is the result of an increase in blood glucose levels[2].

2. Blood glucose is the sugar content in the blood and has an important role in the body, namely as an energy provider for the body to be able to work and do its job^[3]. Glucose regulation must be in the right amount (80-199 mg/dl with a blood glucose test) in the blood. A person with glucose levels not in the normal category can experience hypoglycemia (<80 mg/dl with a blood glucose test) is a condition where glucose levels are below the normal level in the body and hyperglycemia (>200 mg/dl with a blood glucose test) is a condition where blood glucose levels are high above normal values so that hypoglycemia and hyperglycemia can affect metabolic balance. A situation with unbalanced glucose levels if not treated quickly can lead to complications or conditions where the disease gets worse or worse^[4][Click or tap here to enter text..](#)

Factors that influence the imbalance of blood glucose levels according to previous studies show that the result of

lack of movement and exercise, Body Mass Index, stress, using certain drugs, age, disease, family history, and diet with unbalanced portions of food such as excess carbohydrates, too many calories and too frequent consumption of sweet drinks^[5]. Physical activity is body movement that causes energy expenditure (calorie burning) which includes daily physical activity, and sports and is an activity that is carried out for at least 10 minutes without stopping in its subcategory physical activity is an activity that is planned, structured, repetitive and aims to improve or maintain one or more components of physical fitness^[6]. Physical activity can affect health, especially blood glucose levels. Based on the previous study a lack of physical activity can cause the degradation of surfaces where glucose transport occurs which can ultimately cause insulin resistanc^[7]. physical activity can reduce blood glucose levels by increasing the sensitivity of muscle cells to insulin^[8].

Further study has identified a significant relationship between lack of physical activity and metabolic syndrome with the risk of diabetes mellitus being lower in the group who exercise 5 times a week with a

minimum of 10 minutes compared to exercising 1 time a week for 30 minutes, so the lower the physical activity carried out, the higher the risk of an increase in blood glucose levels^[9]. Physical activity can affect reducing blood glucose levels up to 30 mg/dL, with an average decrease of 2% with strenuous exercise 3 times a week with a minimum of 30 minutes^[10]. Someone who has a habit of doing light physical activity has a chance of developing diabetes mellitus 2.9 times compared to someone who has a habit of doing heavy physical activity and someone with moderate physical activity has a chance of developing diabetes mellitus, which is 1.8 times compared to those with heavy physical activity^[11]

Body Mass Index is a measure used to determine a person's nutritional status obtained from the comparison of weight and height. A person with an obese BMI (with a BMI $>25.0 \text{ kg/m}^2$) or overweight (with a BMI of $23.0\text{-}24.9 \text{ kg/m}^2$) can have an impact on metabolism, especially on blood glucose levels. People with obesity have a significant association with Diabetes Mellitus which is 7.1 4 times greater than the normal BMI group^[12].

A person who is obese will experience excessive fat accumulation

and close insulin sensitivity to glucose causing hyperglycemia excessive fat accumulation can increase blood glucose levels^[8]. In addition, research on participants in prolonged activities at the Dau Health Center in Malang Regency revealed that there was a relationship between body mass index and blood glucose levels in adults with an age range of 25-60 years with an increase in blood glucose levels along with an increase in body weight however another study showed that there was no relationship between body mass index and blood glucose levels^[13].

Blood glucose levels are associated with an unhealthy lifestyle such as sedentary physical activity and a high body mass index, which increases the risk of non-communicable diseases (NCDs), namely diabetes mellitus. Unhealthy lifestyles are found in people who work in professions such as drivers, factory workers or shift workers, and office workers or Information Technology employees^[14]. Bus driver is a profession that is responsible for driving the bus and taking passengers to their destination safely and on time. According to the Ministry of Transportation Law No. 22 Year 2009 Article 90 "public vehicle drivers have a limit on working time and rest time. The driver's working time is 8

hours a day and every 4 hours a 15-minute break, but under certain conditions, the driver can work up to 12 hours including one hour break in a day^[15]. Bandung bus drivers under the auspices of the DAMRI company (Djawatan Angkoetan Motor Repoeblik Indonesia) are an Indonesian State-Owned Enterprise engaged in land transportation and have been established since 1946. The services provided by the DAMRI company are urban transportation, intercity transportation, interstate transportation, and tourism transportation.

After conducting a preliminary study of the factors that influence blood glucose levels in 13 respondents with an age range of 37-55 on DAMRI drivers in the pool Jl. Soekarno Hatta obtained the results, of 3 respondents with hereditary DM or genetics from the closest family. 11 respondents who consume coffee or tea with sugar or drinks that have a high sugar content such as soda, energy drinks, and other packaged drinks more than 3x a day. There was 1 respondent with physical activity such as running, 7 respondents with physical activity not exercising, and most of the time done for rest such as sleeping, and 5 respondents with physical activity by doing housework such as sweeping, mopping, or

gardening. Body Mass Index (BMI) in bus drivers is high because 6 respondents have a BMI in the overweight category of 23.0-24.9 kg/m² and 2 respondents have a BMI in the Obesity category >25 kg/m². There are 2 respondents with conditions that often experience stress or pressure when working. There are 2 respondents with type 2 DM disease. Blood glucose levels by examination at any time (GDS) 1 respondent with low GDS (<70 mg/dl) 2 respondents with high GDS (>200 mg/dl) and 5 respondents with GDS in the normal limit (146-199 mg/dl). All respondents did not receive health services from the company and only 2 respondents did health checks at the health center.

Based on the explanation many respondents who have low physical activity and high Body Mass Index in DAMRI bus drivers, so researchers will conduct a study entitled The Relationship between Physical Activity and Body Mass Index with Blood Glucose Levels in DAMRI Bus Drivers in Bandung City 2023.

2. Methods

The research method in this study used a quantitative approach, and the method used an analytical survey, while the design in this study is a cross-sectional design. The independent

variables in this study are physical activity and body mass index, and the dependent variable is blood glucose levels. The hypothesis in this study is the null hypothesis (H0): There is no relationship between physical activity and body mass index with blood glucose levels in DAMRI bus drivers Bandung 2023, while the alternative hypothesis (Ha): There is a relationship between physical activity and body mass index with blood glucose levels in DAMRI Bandung 2023 drivers.

The population in this study were DAMRI bus drivers in Kebon Kawung pool, Bandung with 50 respondents and sample technique used by researchers

is total sampling where the entire population is used as a research sample.

Data analysis in this study used a univariate analysis using frequency distribution, which aims to determine the percentage value of each variable analyzed, namely the Physical Activity variable, Body Mass Index, and blood glucose levels. Bivariate analysis in this study used Chi-Square analysis, which aims to find whether there is a relationship between the variable knowledge of physical activity with blood glucose levels and the relationship between body mass index and blood glucose levels.

3. Result

Table 1 Distribution of Physical Activity Measurements among DAMRI Bus Drivers in Bandung City 2023

Physical Activity	Frequency	Percentage
Hight	5	10.0
Medium	16	32.0
Low	29	58.0
Total	50	100%

The results of the study presented in Table 1 above show that out of 50 respondents there 29 people had less physical activity, namely 58.0%, 16 respondents (32%) had moderate physical activity and 5 respondents (10%) had high physical activity in DAMRI bus drivers.

Table 2. Distribution of Body Mass Index (BMI) Measurements in DAMRI Bus Drivers in Bandung City 2023

Body Mass Indeks (BMI)	Frequency	Percentage
Less	1	2.0
Normal	12	24.0
Fat	10	20.0

Body Mass Indeks (BMI)	Frequency	Percentage
Obesity	27	54.0
Total	50	100%

The results of the study in Table 2 above show that out of 50 respondents, there were 27 respondents (54%) with obese body mass index, 10 respondents (20%) with obese body mass index, 12 respondents (24%) with normal body mass index, and 1 respondent (2%) with less body mass index in DAMRI bus drivers.

Table 3. Distribution of Timed Blood Glucose Level Measurement Results among DAMRI bus drivers in Bandung City 2023.

Blood Glucose Level	Frequency	Percentage
Low	3	6.0
Normal	31	62.0
Prediabetes	12	24.0
Diabetes	4	8.0
Total	50	100%

The results of the study in Table 3 above show that out of 50 respondents, there were 3 respondents (6%) with poor blood glucose levels, 31 respondents (62%) with normal blood glucose levels, 12 respondents (24%) with prediabetic blood glucose levels and 4 respondents (8%) with diabetic blood glucose levels.

Table 4. Distribution of Physical Activity Measurement on Blood Glucose Levels of DAMRI Bus Drivers in Bandung City 2023

Physical Activity	Blood Glucose Level								Total	P-Value	r	
	Low		Normal		Prediabetes		Diabetes					
	n	%	n	%	n	%	n	%				
Hight	3	60.0%	2	40.0%	0	0.0%	0	0.0%	5	100%	0.004	0.581
Medium	0	0.0%	15	93.8%	1	6.3%	0	0.0%	16	100%		
Low	0	0.0%	14	48.3%	11	37.9%	4	13.8%	29	100%		
Total	3	6.0%	31	62.0%	12	24.0%	4	8.0%	50	100%		

The statistical test results obtained p value = 0.004 and the value of r = 0.581 indicate that there is a relationship between physical activity and blood glucose levels and there is a moderate correlation with a negative meaning where the lower the measurement results of a person's physical activity, the higher the blood glucose levels and vice versa the higher the measurement results of a person's physical activity, the lower the blood glucose level.

Table 5 Measurement Results of Body Mass Index (BMI) on Blood Glucose Levels in DAMRI Bus Drivers in Bandung City 2023

Body Mass Indeks	Blood Glucose Level								Total	P-Value	r	
	Low		Normal		Prediabetes		Diabetes					
	n	%	n	%	n	%	n	%	n	%		
Less	1	100%	0	0.0%	0	0.0%	0	0.0%	1	100%		
Normal	2	16.7%	10	83.3%	0	0.0%	0	0.0%	12	100%		
Fat	0	0.0%	9	90.0%	0	0.0%	1	10.0%	10	100%	0.019	0.556
Obesity	0	0.0%	12	44.4%	12	44.4%	3	11.1%	27	100%		
Total	3	6.0%	31	62.0%	12	24.0%	4	8.0%	50	100%		

The statistical test results obtained p value = 0.019 and the value of r = 0.556 shows that there is a relationship between body mass index and blood glucose levels and a moderate correlation relationship with a positive pattern, meaning that the greater the measurement of a person's body mass index, the greater the blood glucose level.

4. Discussion

Physical Activity Outcomes of DAMRI Bus Drivers in Bandung City 2023

The results of the study in Table 1 show that the results of the study of 50 respondents with the results of the study obtained from 5 respondents (10%) respondents with the highest physical activity, namely having METs results of 3351 Minutes / Week, while 29 respondents (58%) with the lowest physical activity had METs results of 231 Minutes / Week and 16 other respondents had moderate physical activity with a range of METs 651-1314 Minutes / Week.

Excessive physical activity will activate relative hypoxic conditions that occur in organs such as the liver, kidneys, and intestines caused by

redistribution of blood flow to working muscles so that it can stimulate oxidative stress biomarker responses. Increased systemic oxidative stress can reduce insulin concentrations and in humans cause insulin resistance in someone without diabetes. This is because in people with type 1 diabetes, there is an invasion of macrophages and dendritic cells in the pancreatic islets of Langerhans and stimulates T cell-mediated immunity that can damage pancreatic β cells. Macrophages and dendritic cells as a primary factor in the occurrence of type 1 diabetes are activated by intracellular ROS production^[16].

Lack of physical activity will decrease insulin signal modulators or adipokines secreted by adipose tissue which have functions to increase insulin

sensitivity, reduce hepatic gluconeogenesis, and increase glucose absorption in tissues and muscles. This cytokine has anti-inflammatory properties that affect the nuclear factor (NF- κ B) pathway and also affects insulin sensitivity in peripheral tissues. Receptors on adiponectin (AdipoR1) found in muscle tissue will bind to Globular Head Group Adiponectin (gScrp30) and activate adenosine monophosphate kinase (AMPK) through receptor-specific signaling pathways, then will cause fatty acid oxidation and increase glucose uptake in cells^[17].

High physical activity, namely activities such as heavy lifting, hiking, and running with an exceeding time of 150-300 minutes/week can lead to fatigue and health problems such as pain in muscles, joints, and bones. In bus drivers, high physical activity with a lack of rest can reduce concentration when driving which can be fatal to safety. Meanwhile, low physical activity with less than 600 METs / week can have an impact on health, especially on the risk of a disease, one of which is blood glucose levels^[18].

Bus drivers have an average of low physical activity with 29 respondents (58%) this occurs due to work factors where bus drivers have, the type of

work with too much sitting for hours so that they do not spend enough energy which will have an impact on health^[19]. The same thing was also revealed that the physical activity of office workers or jobs with having to sit for hours often finds results where this lack of physical activity occurs due to several factors such as fatigue and weakness, not having time, fear of illness, and the availability of supporting facilities and facilities^[20].

The results of this study found 29 people (58%) with low physical activity out of a total of 50 respondents. These results are followed with research conducted by a study on public transportation drivers by categorizing physical activity into 2, namely active and less physical activity by calculating the time to do physical activity without assessing its intensity, 44 respondents (21.9%) experienced less physical activity. While the description of physical activity obtained from the study on taxi drivers in South Africa, 57 respondents did not do physical activities such as recreational physical activity, and sports^[21].

Overview of Body Mass Index (BMI) Results in DAMRI Bus Drivers in Bandung City 2023

The results of the study in Table 2 show that the results of the study of 50 respondents showed a body mass index of less than there was 1 person (2%), namely the lowest body mass index in respondents with the results of 18.1 kg/m², normal body mass index there were 20 people (20%) with measurement results of 20.0 - 22.1 kg/m², obese body mass index there were 10 people (20%) with measurement results of 23.6 - 24.6 kg/m² and obese body mass index there were 27 people (54%), namely the highest body mass index in obese respondents with measurement results of 40.0 kg/m².

Obesity is defined physiologically as a condition of excessive fat accumulation in adipose tissue. This fat accumulation will lead to impaired secretion of adipokines from adipose tissue and the formation of chronic inflammatory mediators and will also lead to increased expression of inflammatory mediators, such as expression of TNF α , IL6, and IL1 β . The formation of inflammatory mediators, especially IL6 will stimulate hepatocytes to secrete C-reactive protein (CRP). The effect of the expression of inflammatory mediators will cause insulin resistance through the secretion of suppressor of cytokine

signaling (SOCS) and protein tyrosine phosphatase 1B (PTPB) which will then inhibit the insulin signaling cascade pathway by dephosphorylating the insulin receptor, inhibiting the process of insulin phosphorylation and insulin receptor degradation (IRS)^[17].

Increased body mass index in bus drivers can occur due to poor lifestyle patterns such as eating patterns with consumption of sugary drinks or food consumption without knowing the number of calories that the body needs in a day, as well as lack of physical activity according to Santoso (2020). The results of this study found 27 people (54%) with an obese body mass index out of a total of 50 respondents. These results are from research conducted by Santoso et al (2020) on inter-city bus drivers in the GM company having an obese body mass index of 95 people (54%) out of a total of 176 respondents and the corresponding results were also carried out by Taringan et al (2020) revealing the body mass index in Jakarta taxi drivers, Indonesia there were 93 people (87.7%) had a body mass index with an obese category out of a total of 106 respondents.

Overview of Blood Glucose Level Results in DAMRI Bus Drivers in Bandung City 2023

The results of the study in Table 3 showed that 50 respondents had low blood glucose levels as many as 3 people (6%), namely the lowest blood glucose levels in respondents with the results of 56 mg/dl, normal blood glucose levels as many as 31 people (62%) with the results of 71-144 mg/dl, prediabetes blood glucose levels as many as 12 people (24%) with the results of 145-193 mg/dl and diabetic blood glucose levels as many as 4 people (6%), namely the highest blood glucose levels in respondents with diabetes with the results of 225 mg/dl.

Glucose is produced from incoming food in the form of carbohydrates, proteins, and fats will be absorbed and converted into monosaccharides then into fructose and glucose. Glucose that enters the blood becomes the main ingredient of cellular respiration in the body then in the first stage of glycolysis, glucose is converted into 2 molecules of pyruvic acid, where every 1 molecule of glucose is converted into 2 molecules of pyruvic acid in the glycolysis stage. Then each of the pyruvic acid molecules undergoes carbonization and reacts with Coenzyme A and forms Acetyl Co.A. Acetyl Co.A enters the

Creap cycle stage or citric acid cycle and in the last stage becomes oxidative phosphorylation. This process in cellular respiration will produce 36 to 38 ATP (Adenim Tripospat) which is a high-energy compound in the body and almost all chemical reactions that occur in the body involve ATP. ATP is a source of energy produced from each stage of cellular respiration^{[22][23]}

Glucose is the main source of energy for human cells. Blood glucose is the level of sugar present in the blood that is formed from carbohydrates in the diet and stored as glycogen in the liver and muscles. Imbalance in blood glucose levels can occur due to several factors such as genetics, age, physical activity, and body mass index. Genetic imbalance of blood glucose levels occurs due to a family history of diabetes mellitus either a history of diabetes from the father or mother which is likely to be 25% or a history of diabetes from both parents is likely to be 50% and a history of diabetes from both parents with a diagnosis of diabetes mellitus at the age of less than 30 years is at risk of developing diabetes by 70%^[8].

Increasing age causes physical changes and a decline in bodily functions that affect nutrient intake and absorption. The risk for a 40-year-old to

develop metabolic syndrome is 3.804 times higher, making age a significant factor in the increase of blood glucose levels. This is evident from the rising prevalence of type 2 diabetes mellitus with advancing age. Type 2 diabetes mellitus generally occurs in nearly 90% of adults, with 50% of cases occurring in individuals over 60 years old^[24].

The results of this study obtained prediabetes in 12 people (24%) and diabetes in 4 people (8%) from a total of 50 respondents. These results follow research conducted by a previous study on taxi drivers in Jakarta City having blood glucose levels with prediabetes and diabetes categories of 58 people (54.7%) out of a total of 106 respondents^[25]. The same thing was also done by another study showed that the taxi bus drivers in South Africa found that taxi drivers had blood glucose levels in the obese category of as many as 64 people (23.5%)^[21].

Relationship between Physical Activity and Blood Glucose Levels in DAMRI Bus Drivers in Bandung City 2023

Based on Table 4, the results of research conducted on DAMRI bus drivers in Bandung City with 50 respondents obtained a correlation coefficient (r) of 0.581 and a p-value =

0.004, the conclusion from these results is that the relationship between the results of physical activity measurements with blood glucose levels in bus drivers shows a moderate correlation relationship with the lower the measurement results of a person's physical activity, the higher the blood glucose levels and vice versa the higher the measurement results of a person's physical activity, the lower the blood glucose levels. The results of statistical tests found a relationship between the results of physical activity measurements with blood glucose levels (p-value = 0.004).

Excessive physical activity can affect blood glucose levels which can cause hypoglycemia, a condition where blood glucose levels are below the value (<70 mg/dl by examination). The decrease in blood glucose levels due to high physical activity occurs due to hypoxic conditions that cause redistribution of blood flow to working muscles so that it can stimulate oxidative stress biomarker responses. Increased systemic oxidative stress can reduce insulin concentration^[16].

Lack of physical activity can affect blood glucose levels which can lead to hyperglycemia, a condition where blood glucose levels are above the value (<200 mg/dl by examination at any

time). increased blood glucose levels due to low physical activity occur due to conditions of decreased insulin signaling or adipokines which result in decreased insulin sensitivity^[17]).

Physical activity can reduce blood glucose levels up to 30 mg/dL with an average decrease of 2% with strenuous exercise 3 times a week for at least 30 minutes a day also the doctors' recommendations to patients with pre-diabetes and people with normal glucose levels to do physical activity should be done regularly for at least 30 minutes a day which refers to the World Health Organization (WHO) regarding the amount of activity^[10].

According to Sari (2020, in Lubis & Kanzanabila 2021) revealed that a decrease in blood glucose levels occurs because doing moderate to heavy physical activity will use more blood glucose so that glucose burned into energy will cause energy cells to become more sensitive to insulin and better blood circulation and the occurrence of type 2 diabetes will decrease to 50% besides that high physical activity can help reduce body weight and weight loss can be beneficial for improving insulin resistance, controlling blood glucose and various other health problems. The same thing was also revealed by

previous study revealed that low physical activity with less than 3 times a week with a minimum of 30 minutes of activity per day can result in fat accumulation in the body and insufficient insulin to convert glucose into energy which causes diabetes mellitus^[26].

The results of research conducted by researchers found a relationship between physical activity and blood glucose levels and a moderate correlation with negative meaning, namely the lower a person's physical activity, the higher the blood glucose and vice versa (p-value = 0.004 and correlation value $r = 0.581$).

Relationship between Body Mass Index and Blood Glucose Levels in DAMRI Bus Drivers in Bandung City 2023

Based on Table 5, the results of research conducted on DAMRI bus drivers in Bandung City with 50 respondents obtained a correlation coefficient (r) of 0.556 and p-value = 0.019, the conclusion from these results is that the relationship between body mass index measurement results and blood glucose levels in bus drivers shows a moderate and positive correlation relationship, meaning that the greater the measurement of a

person's body mass index, the greater the blood glucose level. Statistical test results showed a relationship between body mass index measurements and blood glucose levels (p -value = 0.019).

An increase in body mass index can affect the increase in blood glucose levels due to the accumulation of fat which causes disruption of adipokine secretion and increased expression of inflammatory mediators that will cause insulin resistance through the secretion of suppressor of cytokine signaling (SOCS) and protein tyrosine phosphatase 1B^[17].

A high body mass index can lead to obesity which leads to other health risks such as type 2 diabetes mellitus, this happens because obesity is an excessive accumulation of fat due to an imbalance in food intake and expenditure. Obesity causes the response of pancreatic beta cells to an increase in blood glucose to decrease, in addition to insulin receptors on cells and less sensitive, in addition to increasing insulin resistance or a condition where when body cells ignore or reject signals from the hormone insulin resulting in inhibition in the uptake of glucose or sugar into muscles and fat cells causing blood glucose levels to increase^[12], the same thing is also expressed the obesity with an

excess body weight of at least 20% of the ideal weight or body mass index of more than 25 kg / m² the obesity category can cause the response of pancreatic beta cells to blood glucose to decrease, besides that insulin receptors on cells in the body including cells in the muscles are reduced in number and reduced sensitivity^[27].

Further study also found that there is a percentage of body fat to blood glucose levels, the presence of a high percentage of body fat that is more than 30% can affect the increase in blood glucose levels due to high inflammatory cytokines that cause insulin resistance (pancreatic B cell failure) blood glucose levels^[28]. The results of research conducted by researchers found a relationship between body mass index and blood glucose levels and a moderate correlation with a positive meaning, namely the higher a person's body mass index, the higher the blood glucose level and vice versa (p -value = 0.019 and correlation value $r = 0.556$). This can be caused by several factors such as age, diet, physical activity, and even disease.

5. Conclusions

The results of the analysis in Table 1 show that out of 50 respondents, 29 respondents (58%) had low physical activity. 2) Table 2 shows the results

that out of a total of 50 respondents, there were 27 respondents (54%) with an obese Body Mass Index category. 3) Table 3 found that 50 respondents had normal blood glucose levels 31 respondents (62%). 4) The results of data analysis Table 4 obtained p value = 0.004 and the correlation coefficient (r) = 0.581, it can be concluded that there is a relationship between physical activity and blood glucose levels and there is a moderate correlation with negative meaning. 5) p-value = 0.0019 and correlation coefficient (r) = 0.556, it can be concluded that there is a relationship between body mass index and blood glucose levels and there is a moderate correlation with positive meaning.

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