



Dietary Habits and Physical Activity Affect Random Blood Sugar Levels in Outpatients

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A B S T R A C T

Diabetes is caused by several etiology resulting in the body not using glucose into the cells, so glucose accumulates in the blood. The pancreas cannot produce the particular hormone in type 1 diabetes. Meanwhile, type 2 diabetes is caused by the inefficient use or deficiency of certain hormones relative to blood glucose levels. This study analyzes the correlation between dietary regulation and physical activity and blood sugar levels in outpatients. This paper was a cross-sectional analytic study. The population was all outpatients who checked their blood sugar levels at the Internal Medicine Specialist Clinic of Islamic Hospital Surabaya from January to February 2021. Meanwhile, there were 115 respondents with total random sampling. The independent variable was random blood sugar (RBS) levels, while the dependent variables were dietary habits and physical activity. Data collection used medical records at the Internal Medicine Specialist Clinic of Islamic Hospital Surabaya. Then, data analysis utilized Fisher's Exact Test with a significance of 0.05. Most respondents had regular dietary habits (53%) and normal random blood sugar levels (54%). In addition, they had regular physical activity (80%), with frequency once a week (34.8%), and most types of physical activity were gymnastics (34.8%). The Fisher's Exact Test obtained $p=0.000$ in analyzing between dietary habits and RBG levels. In addition, $p=0.000$ in evaluating between physical activity and RBG levels. Dietary habits and physical exercise affect random blood sugar levels in outpatients. Further study should evaluate other factors associated with blood sugar levels.

INTRODUCTION

Diabetes is a chronic disease followed by high glucose symptoms. Glucose is the primary energy source for human body cells (Haqiqi Ilham mardiantun 2019). Glucose accumulation in the blood due to inadequate absorption by body cells can cause various organ problems in the human body (Anggraeni and Rachmawati 2018). Uncontrolled diabetes can lead to various life-threatening complications for people with diabetes. It is a severe threat to the body because of its gradual development (Nobel Bistara and Ainiyah 2018). It can lead to dangerous complications. No wonder it is called the silent killer. Its complications include (1) Difficult wound healing, (2) amputation, (3) blindness, (4) dental disease, (5) heart disease and stroke, (6) kidney damage, (7) destruction of nerves, (8) Various types of cancer, such as colon cancer, prostate cancer, breast cancer, and endometrial cancer (Azitha, Aprilia, and Ilhami 2018). Under normal circumstances, the body's cells use glucose as energy. A hormone that helps glucose absorption in the body's cells is insulin. The pancreas produces the hormone insulin. Diabetes can be

divided into type 1 and type 2 diabetes. Type 1 diabetes is an autoimmune disease. The body's immune system attacks and destroys the pancreatic cells that produce insulin. Furthermore, it causes blood sugar elevation and stimulates damage to the body's organs. Type 2 diabetes is a more common type of diabetes because of the less sensitive body's cells to insulin, so the insulin cannot be used properly (insulin resistance). Almost all people with diabetes in the world have type 2 Diabetes (Nurayati and Adriani 2017).

Diabetes is caused by several body disorders so that the body cannot use blood glucose into cells; as a result, glucose builds up in the blood (Purnama and Sari 2019). The etiology of type 1 diabetes is the pancreas cannot produce certain hormones. Meanwhile, insulin resistance and usually relative insulin deficiency occur in type 2 diabetes. High glucose levels can irritate the small blood vessels in the kidneys, heart, eyes, and nervous system, causing various complications (D. Bistara et al. 2020). Type 1 and type 2 diabetes symptoms include (1) Frequent thirst, (2) Increased urination frequency, especially at night, (3) constant hunger, (4) Weight loss for no apparent reason, (5) tired, (6) blurred vision, (7) long-healing injuries, (8) inflammation of the skin, urinary tract, gums (Amrullah 2020).

Diabetes is diagnosed based on a medical interview, physical, and laboratory examination (blood and urine test) (M Irhas and Kurniawan 2017). A blood sugar test aims to measure the sugar (glucose) levels in the blood. There are several ways to evaluate blood sugar; one of them is using a glucometer (Nurjana and Veridiana 2019). The goal is not only to diagnose diabetes but also to evaluate whether the blood sugar levels in people with diabetes are well controlled. Glucometers could evaluate blood sugar levels at any time (Wijayanti, Wardani, and Bistara 2019). Blood sugar levels with normal conditions are (1) Before eating: 70-130 milligrams/dL (2) Two hours after eating: less than 180 milligrams/dL (3) After fasting for 8 hours: less than 100 milligrams/dL, (4) At bedtime: 100-140 milligrams/dL¹¹. There are several activities to prevent high blood sugar levels, including regular exercise and a diabetic diet. Regular exercise can control blood sugar. Exercising at least 2.5 hours per week can train muscle strength and burn calories. A diabetic diet is limiting carbohydrate (Setyawan and Sono 2015) consumption. Selected sources of carbohydrates are sweet potatoes, whole grain pasta, and brown rice. Other good foods for consumption are nuts such as almonds, salmon, skinless chicken breasts. This study analyzes the correlation between dietary regulation and physical activity on random blood sugar levels in outpatients at the Internal Medicine Specialist Clinic of Islamic Hospital Surabaya.

METHOD

This paper was a cross-sectional analytic study. The population was all outpatients who checked their blood sugar levels at the Internal Medicine Specialist Clinic of Islamic Hospital Surabaya from January to February 2021. Meanwhile, there were 115 respondents with total random sampling. The independent

variable was random blood sugar (RBS) levels, while the dependent variables were dietary habits and physical activity. Data collection used medical records at the Internal Medicine Specialist Clinic of Islamic Hospital Surabaya. Then, data analysis utilized Fisher's Exact Test with a significance of 0.05 to evaluate the correlation between independent and dependent variables.

RESULT

The results in this paper included characteristics of respondents, dietary habits, physical activity, random blood sugar levels, and statistical analysis.

Table 1. Characteristic of respondents by age and gender

Characteristics of Respondents	Frequency	Percentage (%)
Gender		
Male	45	39.1
Female	70	60.9
Age		
41 - 45 years old	34	29.6
46 - 50 years old	64	55
51 - 55 years old	15	13
55 - 60 years old	2	1.7
Total	115	100

Table 1 describes that most outpatients at the Internal Medicine Specialist Clinic of Islamic Hospital Surabaya are female (60.9%) and from 46 to 50 years old (55%).

Table 2. Frequency Distribution of Respondents Based on Dietary Habits, Physical Activity, and Random Blood Sugar (RBS) Levels

Variables	Frequency	Percentage (%)
Dietary habits		
Regular	61	53
Irregular	54	47
Physical Activity		
Physical inactivity	23	20
Regular physical activity	92	80
Type of physical activity		
Cycling	25	27.2
On Foot Exercise	30	32.6
Running	5	5.4
Gymnastics	32	34.8
Frequency of physical activity (per week)		
Once	32	34.8
Twice	22	23.9
Three Times	12	13.0
More Than 4 Times	26	28.3
Random Blood Sugar Levels		
Normal	62	54
High	53	46
Total	115	100

Table 2 shows that most respondents have regular dietary habits (53%) and normal random blood sugar levels (54%). In addition, most of them have regular physical activity (80%), with frequency once a week (34.8%), and most types of physical activity are gymnastics (34.8%).

Table 3. Cross-Tabulation between Diet Habits and Random Blood Sugar (RBS) Levels

		RBS Levels		Total
		Normal	High	
Dietary Habits	Irregular	3	51	54
	Regular	59	2	61
Total		62	53	115
Fisher's Exact Test				0.00000

Table 3 reveals that three respondents with irregular dietary habits have normal RBS levels, and 51 samples have high RBS levels because they have irregular dietary habits. On the contrary, 59 people with regular dietary habits have normal blood sugar levels, and only two individuals with high RBS levels because of irregular dietary habits. The Fisher's Exact Test shows $p=0.000$ ($p<0.05$), indicating a significant correlation between dietary habits and random sugar blood levels.

Table 4. Cross-Tabulation between Physical Activity and Random Blood Sugar (RBS) Levels

		RBS Levels		Total
		Normal	High	
Physical Activity	Physical inactivity	0	23	23
	Regular physical activity	62	30	92
Total		62	53	115
Fisher's Exact Test				0.00000

Table 4 indicates that 92 respondents with regular physical activity, 62 of them have normal RBS levels, and 30 have high RBS levels. Meanwhile, all respondents (23 samples) with physical inactivity have high RBS levels. The Fisher's Exact Test obtains $p=0.000$ ($p<0.05$), indicating a significant correlation between physical activity and random sugar blood levels.

DISCUSSION

In this study, most respondents had regular dietary habits. Calories are an essential factor for the body in maintaining energy during activities. Calories can be obtained from daily food; daily calorie needs also need to be considered, not excessive or deficient. Each person's calorie needs are different. Daily calorie needs are based on gender, health status, body weight, and size. The recommended number of calories for diabetes per day is 25-30 calories per kg of body weight; the composition of carbohydrate content: 50-60% of calorie needs or a minimum of 130 grams per day, protein: 10-15% of calorie needs, Fat: 20-25% of calorie requirements, and fiber: 25 grams per day (M Irhas and Kurniawan 2017). Diet regulation in people with diabetes must consider the schedule, amount, and type of food (Kumaladewi Hengky and Haniarti 2018).

In addition, most respondents had regular physical activity once a week, and most types of physical activity were gymnastics. World Health Association (WHO) defines physical activity as any bodily movement produced by skeletal muscles requiring energy expenditure. It also includes activities performed while working, playing, doing household chores, traveling, and engaging in recreational

activities. The term physical activity should not be confused with exercise. Sport is a subcategory of physical activity that is planned, structured, repetitive, and aims to improve or maintain one or more components of physical fitness. Apart from exercise, any physical activity done during leisure time, for transportation to and from a place, or as part of work, has health benefits (D. N. Bistara 2019). Physical activity has a light, moderate, or vigorous-intensity to improve health status. Lack of physical activity is a risk factor for chronic disease and is estimated to cause death globally (Susanti and Bistara 2021). Regular sports activities play an essential role in stabilizing blood sugar levels in diabetes (Putri 2017). Nevertheless, they must adapt workouts according to age and health status.

Furthermore, most samples in this study had normal random blood sugar levels. The blood sugar level is the amount of glucose content in blood plasma. Blood sugar levels are used to establish the diagnosis of DM. For determination of diagnosis, the recommended examination is an enzymatic examination with venous plasma blood material. Meanwhile, capillary blood sugar examination with a glucometer can monitor the treatment results.

There was a significant correlation between dietary habits and random blood glucose levels (Steyn et al. 2004). Dietary habits are associated with metabolic disorders, such as insulin resistance, obesity, type 2 diabetes, and cardiovascular diseases. A previous study showed that consuming fruits, vegetables, and legumes was correlated with a reduced risk of insulin resistance and type 2 diabetes (Liu et al. 2004). Meanwhile, other research revealed that higher consumption of total meat might lead to insulin resistance and related chronic disease development, such as obesity, diabetes (Panagiotakos et al. 2005), and cardiovascular diseases.

There was a correlation between physical activity and random blood glucose levels. The effect of physical activity or exercise is directly related to an increase in the speed of muscle glucose recovery – how much muscle takes glucose from the bloodstream. During the workout, the body muscles use the glucose stored in the muscles. When the glucose is depleted, the muscles fill the gaps by taking glucose from the blood. Then, it will decrease blood glucose, thereby increasing blood glucose control. Exercise has significant benefits for people with diabetes, which helps improve insulin sensitivity and keep blood sugar levels under control. When exercising, the body needs extra energy, which causes the muscles to absorb glucose and decrease blood sugar levels. Exercising can also help prevent obesity in people with type 2 diabetes (Prastika, 2020).

CONCLUSIONS

This study concludes that dietary habits and physical exercise affect random blood sugar levels in outpatients. Further study should evaluate other factors associated with blood sugar levels to prevent complications of high blood sugar levels.

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