

## Original Article

# The relationship between stress level and physical activity and diabetes diet quality during the pandemic

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Received: 21 September 2023 / Accepted: 21 December 2023

### Abstract

Stress levels, physical activity and diet quality are very important for people with diabetes to prevent complications; stress during a pandemic and lack of physical activity will change the quality of a diabetic's diet—observational analytic research with a cross-sectional approach with a total of 90 respondents. Data was collected using a Perceived Stress Scale (PSS) questionnaire, Physical Activity Questionnaire (IPAQ) Short Version, Food Frequency Semy Quantitative, Diet Quality Index International (DQI-I), Nutrisurvey 2007. Data processing was carried out univariately and bivariately. From this study, the stress level of some respondents, 51 people (56.6%), was moderate. Physical activity of some respondents with low physical activity, with a total of 55 people (61.1%). Some of the respondents' physical activity had low diet quality, totaling 81 (90.0%). Most respondents had moderate stress levels with low physical activity, namely 50 people (61.1%), moderate stress levels with low diet quality, namely 49 people (54.4%), and low physical activity with low diet quality, namely 52 people. (57.8%) and there is a significant relationship between stress levels and physical activity with diet quality ( $p < 0.05$ ). In conclusion, the more severe the stress level and the lower the physical activity, the lower the diet quality.

**Keywords:** stress level, physical activity, diet quality, diabetes mellitus.

### Introduction

Diabetes mellitus is a metabolic disease caused by defects in insulin secretion, insulin action or both. Diabetes mellitus is characterized by high blood glucose levels (hyperglycemia). Indonesia ranks fifth in the world with the most Diabetes Mellitus sufferers, with 19.5 million adults aged 20–79 years and is predicted to increase in 2045 to 28.6 million people [1]. The report on the results of Riskesdas (2018), the population aged 15 years diagnosed with Diabetes Mellitus in Karawang Regency has a prevalence of 1.98% [2].

Diabetes mellitus is a disease that has a high risk of severe disease due to COVID-19. Diabetes mellitus is reported to be the most common comorbid disease in COVID-19 patients. Diabetes patients experienced a two to four-fold increase in mortality and severity from COVID-19 compared to COVID-19 patients who did not

suffer from COVID-19 [3]. People with diabetes during the COVID-19 pandemic experienced several problems in social and psychological aspects; social distancing, lockdown, and quarantine made people with diabetes more restless, depressed, anxious and stressed [4]. According to Ruissen (2020), people with diabetes during the pandemic experience increased stress and anxiety, decreased physical activity and increased body weight [3].

Stress experienced by people with diabetes is related to demands in diet and food regulation, drug consumption, and exercise that must be done. People with diabetes during the pandemic experience stress and worry about their illness, which will worsen if exposed to COVID-19 [3]. Stress can increase the appetite of diabetics, especially in foods containing carbohydrates and fats; increased intake makes blood sugar uncontrolled and causes poor diet quality [5]. According to Kaur & Kochar (2017), the majority of diabetes patients, as



much as 74%, experience stress, and another 26% do not experience stress. The stress experienced by diabetes causes a decrease in physical function; people with diabetes become easily tired in carrying out physical activities, which causes their physical activity to decrease [6].

Physical activity is included in the four pillars of diabetes mellitus management. Lack of physical activity will cause insulin resistance in diabetes mellitus 2; the environment can also trigger it, unhealthy living habits such as overeating (fat and lack of fiber), lack of physical activity and stress [7]. When the body performs physical activity, blood flow will increase, and capillary nets will open a lot so that insulin receptors become many and active, affecting the decrease in blood glucose levels in patients with diabetes mellitus [8]. Good physical activity will improve a person’s quality of life and be more obedient to the positive things he is living, such as being obedient to the diet program he is doing.

During the initial lockdown, adults’ diet quality saw a small increase in vegetable consumption, as they had more time to cook nutritious meals [9]. The quality of the diet of someone who works from home during the pandemic has changed. During the pandemic, changes in eating patterns were influenced by food consumption due to boredom and the many promos from food delivery applications [10]. People with diabetes experience a slight difference in diet quality; based on research, it is proven that lockdown has changed dietary patterns and physical activity habits in diabetes. Although there is an increase in vegetable intake, overall food quality still needs improvement. People with diabetes show an increase in food intake. Sweets and snacks are caused by emotions such as boredom from staying home all day or stress caused by a pandemic [11]. Euromonitor International data report (2020), Indonesia experienced an increase in sweet foods such

Table 1: Distribution of responden characteristics.

No.	Karakteristik Responden	n	%
1.	<b>Age</b>		
	30–49 years	20	22.2
	50–64 years	55	61.1
	65–80 years	15	16.7
2.	<b>Gender</b>		
	Male	31	34.4
	Female	59	65.6
3.	<b>Last Education</b>		
	Not Completed in primary school	5	5.6
	Primary school	30	33.3
	Junior high school	17	18.9
	Senior high school	32	35.9
	Associate degree	3	3.3
	Bachelor degree	3	3.3
4.	<b>Profession</b>		
	Unemployment	10	11.1
	Housewife	53	58.9
	Entrepreneur	7	7.8
	employee	11	12.2
	Government employees	3	3.3
	Retired	5	5.5
Farmer	1	1.1	
5.	<b>Stress Level</b>		
	Low	9	10.0
	Currently	51	56.7
	Had Severe	30	33.3
6.	<b>Physical Activity</b>		
	Low	55	61.1
	Currently	17	18.9
	Had Severe	18	20.0
7.	<b>Diet Quality</b>		
	Low	81	90.0
	High	9	10.0

as ice cream and frozen desserts reaching 0.24% in 2021, this increase has occurred since the pandemic period in 2020 [12]. In addition, the physical inactivity of diabetics during the lockdown has increased due to limited activities at home [11].

Poor diet quality in diabetes will lead to complications such as coronary heart disease, peripheral vascular disease, stroke, diabetic nephropathy, amputation, kidney failure and blindness [13]. A good-quality diet will prevent complications in diabetes mellitus; someone who has low knowledge and socio-economic status tends to have a low-quality diet because the quality of the food they consume is not good [14]. Stress levels, physical activity and diet quality are very important for people with diabetes to prevent complications; stress during a pandemic and lack of physical activity will change the quality of a diabetic's diet. Based on this, researchers are interested in researching the relationship between stress levels, physical activity and diet quality in diabetes during the pandemic.

## Material and methods

### Study design and patients

This research is an analytic observational research with a cross-sectional research design. This research was carried out from February 2022 to March 2022 after obtaining a certificate of ethics from the Esa Unggul University Research Ethics Commission (approval ID: 0922-05.016 /DPKE-KEP/FINAL-EA/UEU/V/2022). The sample of this study amounted to 90 people with diabetes. The sampling technique used was purposive sampling. The inclusion criteria in this study were diabetics aged 30–80 years and diabetics who were willing to be respondents. Exclusion criteria were diabetes who had severe complications. Prior to conducting the research, informed consent was carried out first and then

followed by filling out a questionnaire to determine the characteristics, stress level, physical activity and diet quality of the respondents. After that, the height and weight were measured.

### Statistical analysis

The data were analyzed univariately to see the distribution of characteristic frequencies and bivariate analysis using the Kendall Tau test with a significance of  $p < 0.05$  to determine the relationship between stress levels and physical activity with the quality of diabetes diet during the pandemic.

## Results

In the univariate analysis covering the frequency of respondent characteristics based on gender, age, education and occupation, it can be described in Table 1.

Based on Table 1, the frequency distribution of respondent characteristics based on age with diabetes at Telukjambe Public Health Center, most of the respondents were in the 50–64 year age group, as many as 55 people (56.1%). Gender: the number of male diabetics who became respondents was 31 people (34.4%) and female diabetics as respondents were 59 people (65.6%). In the assessment of stress levels using the Perceived Stress Scale (PSS) questionnaire, it was found that the distribution of stress levels in diabetes in the Telukjambe Health Center work area was severe stress, with a total of 51 people (56.7%). In the physical activity assessment using the short version of the Physical Activity Questionnaire (IPAQ), it was found that the distribution of physical activity in diabetes in the Telukjambe Health Center work area was low physical activity, with a total of 55 people (61.1%). Assessment of diet quality using the Food Frequency Questionnaire Semy Quantitative and Diet Quality Index International (DQI-I), it was found

Table 2: The relationship between stress levels and physical activity.

Stress levels	Physical activity						P-value
	Low		Currently		Had severe		
	n	%	n	%	n	%	
Low	2	2.2	2	2.2	5	5.6	0.001
Currently	3	3.3	15	16.7	12	13.3	
Had severe	50	55.6	0	0.0	1	1.1	
Skor	55	61.1	17	18.9	18	20.0	

Table 3: The relationship between stress levels and diet quality.

Stress levels	Diet quality				P-value
	Low		High		
	n	%	n	%	
Low	3	3.3	6	6.7	0.001
Currently	29	32.2	1	1.1	
Had severe	49	54.5	2	2.2	
<b>Skor</b>	<b>81</b>	<b>90.0</b>	<b>9</b>	<b>10.0</b>	

that the distribution of diet quality in people with diabetes in the Telukjambe Health Center working area was of low diet quality with a total of 81 (90.0%).

Table 2 shows the relationship between Stress Levels and Diabetes Physical Activity; it was found that 90 respondents (100%) had severe stress levels with low physical activity, namely 50 people (55.6%). The results of the Kendall Tau test get a value of 0.001 ( $p < 0.05$ ), which shows a significant relationship between stress levels and physical activity.

Table 3 shows the relationship between stress levels and diet quality. It found that 90 respondents (100%) had severe stress levels with low diet quality, namely 49 people (54.4%).

The results of the Kendall Tau test get a value of 0.001 ( $p < 0.05$ ), which shows a significant relationship between stress levels and diet quality. The correlation value  $r = 0.351$  shows a sufficient correlation between stress levels and diet quality.

Scores in the adequacy category of several food groups and nutrients cause the respondent's diet quality to be low. Protein is one of the nutrients whose intake is fulfilled. Meanwhile, the components of the adequacy of fruit, vegetable, and vitamin C scores and the overall balance of macronutrients and fatty acids were mostly less than the daily requirement. The variety of food groups consumed by respondents was only 2 out of 5 food groups/day. Food groups that are mostly not

Table 4: Diet quality.

Component	Diet quality
	Mean±SD
<b>Variety (skor)</b>	12.64±3.88
Overall food group	11.00±2.91
Protein source	1.91±1.08
<b>Adequacy (skor)</b>	11.72±3.39
Grain group	3.25±1.25
Fruit group	0.96±0.81
Vegetable group	1.38±0.81
Fibre	6.40±9.00
Protein	26.77±13.61
Iron	3.43±4.57
Calcium	163.15±164.15
Vitamin C	38.07±32.64
<b>Moderation (skor)</b>	24.94±3.73
Total fat	23.71±13.98
Saturated fat	10.27±6.33
Cholestrol	152.62±186.40
Sodium	199.44±280.88
Empaty caloriefoods	0.48±0.54
<b>Overall balance (Skor)</b>	1.62±2.22
Macronutrients ratio	1.36±2.13
Fatty acid ratio	0.27±0.85
<b>Skor total</b>	<b>51.20±7.13</b>

Table 5: The relationship between physical activity and diet quality.

Physical activity	Diet quality				P-value
	Low		High		
	n	%	n	%	
Low	52	57.8	3	3.3	0.047
Currently	15	16.7	2	2.2	
Had severe	14	15.6	4	4.4	
Skor	81	90.0	9	10.0	

consumed are fruits and vegetables. Low intake of fiber and vitamin C is caused by a lack of high-fiber food groups such as vegetables and fruits (Table 4).

The low diet quality score is influenced by the components of adequacy, size, and overall balance (Maretha et al., 2020). The results of this study also show the same thing, namely the low quality of the respondents' diet due to the low value of variation, adequacy and overall balance due to the low adequacy of vegetables, fruit, vitamin C, micronutrients and fatty acids.

In the relationship between physical activity and diet quality, 90 respondents (100%) had low physical activity with low diet quality, namely 52 people (57.8%). The results of the Kendall Tau test got a value of 0.047 ( $p < 0.05$ ), indicating a significant relationship between physical activity and diet quality. The correlation value  $r = 0.202$  indicates a weak correlation between physical activity and diet quality (Table 5).

Assessment of diet quality using the Food Frequency Questionnaire Semy Quantitative and Diet Quality Index International (DQI-I) questionnaire, it was found that the distribution of diet quality in people with diabetes in the Telukjambe Health Center working area was of low diet quality with a total of 81 (90.0%) out of 90.

## Discussion

There is a significant relationship between stress levels and physical activity. Based on interviews and filling out questionnaires, the stress experienced by respondents was mostly due to unfinished business pressure at work and suffering from diabetes mellitus. Physical activity on foot is the type of physical activity that respondents mostly do.

This study shows a significant positive correlation between stress levels and physical activity. A positive correlation can be interpreted that the higher the stress level, the lower the physical activity. This study's

results align with the research, which states that severe stress and physical activity influence each other [15]. When stressed, a person tends to do physical activities that are not too tiring and avoid this sport because of time constraints and lack of self-regulation. According to Stults-Kolehmainen and Sinha (2014), stress can cause a decrease in physical activity. People often use unhealthy as an expression of emotional coping, such as smoking, drinking and lack of exercise, rather than using physical activity to manage stress [16].

The level of stress with the quality of diet shows that there is a significant relationship. Research showed that someone who had low stress had high dietary adherence. Respondents experienced stress related to food regulation, control of blood sugar levels and taking medication that they had to do all the time [17].

Someone who experiences stress has a relationship with unhealthy eating behavior, characterized by a high intake of sodium snacks and low protein, fruit, and vegetables [18].

Based on the study's results, most respondents experienced stress with low dietary quality scores. This is indicated by the lack of fruit and vegetable intake consumed by the respondents. The results of this study are not in line with the results of research by Alisa et al. (2021), which states that there is no relationship between stress and dietary compliance in diabetes in the pandemic period due to several factors that affect the quality of diet, one of which is having diabetes mellitus for more than 10 years [19].

There is a significant relationship between physical activity and diet quality. According to Gillman, decreased physical activity levels are associated with poor diet. His research proves that physical activity affects diet quality [20]. A person who has low physical activity generally consumes food and nutrients in small quantities, which are considered healthy, so the amount of intake does not match their needs, and the value of diet quality could be higher [21].

## Conclusions

Based on the results of the thesis research with the title “The Relationship between Stress Levels and Physical Activity with the Quality of Diabetic Diabetes in the Pandemic Period”, it can be concluded that the level of stress with physical activity has a significant relationship. This is evidenced by a significant test, which shows:  $p=0.001$  and  $r=0.755$ . When stressed, a person tends to do less tiring physical activity and avoid sports. Stress level with diet quality shows that there is a significant relationship. This is evidenced by a significant test, which shows:  $p=0.001$  and  $r=0.351$ . Someone who experiences stress has a relationship with unhealthy eating patterns, characterized by a high intake of sodium snacks and a low intake of protein, fruit, and vegetables. Physical activity with diet quality showed that there was a significant relationship. This is evidenced by a significant test which shows  $p=0.047$ ;  $r=0.202$ . A person who has low physical activity generally consumes food and nutrients in small amounts.

## Conflict of interest

The authors declare no conflict of interest.

## References

1. Cho, N., Kirigia, J., Ogurustova, K., & Reja, A. *Idf Diabetes Atlas*. 2017
2. Badan Penelitian Dan Pengembangan Kesehatan. National Institute of Health Research and Development Indonesia. Laporan Provinsi Jawa Barat, Risdasdas 2018. Jakarta 2019.
3. Khasanah, D. U., Himawan, F., & Suparjo, S. Stress Levels For People With Diabetes Mellitus During The Covid-19 Pandemic. *Keperawatan Politekkes Kemenkes Semarang*: 39–43, 2020.
4. Raafi, V. A., Saryono, S., & Sari, Y. Implementasi Telehealth Pada Pasien Diabetes Melitus Saat Pandemi Covid-19: Tinjauan Sistematis. *Nurscope: Jurnal Penelitian Dan Pemikiran Ilmiah Keperawatan*: 7(1), 53-60, 2021.
5. Widodo, A. Stress Pada Penderita Diabetes Melitus Tipe-2 Dalam Melaksanakan Program Diet Di Klinik Penyakit Dalam Rsup Dr. Kariadi Semarang. *Medica Hospitalia: Journal Of Clinical Medicine*: 1(1), 53–56, 2013.
6. Maruf, M. A., & Palupi, D. L. M. Hubungan Antara Tingkat Stres Dengan Kualitas Hdiup Penderita Diabetes Melitus Di Wilayah Kerja Rumah Sakit Umum Surakarta. *Prosiding Seminar Informati Kesehatan Nasional*: 2035: 400–410, 2021.
7. Dolongseda, F., Massie, G., & Bataha, Y. Hubungan Pola Aktivitas Fisik Dan Pola Makan Dengan Kadar Gula Darah Pada Pasien Diabetes Melitus Tipe Ii Di Poli Penyakit Dalam Rumah Sakit Pancaran Kasih Gmim Manado. *Jurnal Keperawatan Unsrat*: 5(1), 105542, 2017.
8. Herawati, N., Sa' pang, M., & Harna, H. Kepatuhan Diet Dan Aktivitas Fisik Pasien Diabetes Melitus Tipe 2 Yang Sudah Mengikuti Prolanis. *Nutrire Diaita*: 12(01), 16–22, 2020.
9. Lamarche, B., Brassard, D., Lapointe, A., Laramée, C., Kearney, M., Côté, M., Bélanger-Gravel, A., Desroches, S., Lemieux, S., & Plante, C. Changes In Diet Quality And Food Security Among Adults During The Covid-19-Related Early Lockdown: Results From Nutriquébec. *American Journal Of Clinical Nutrition*: 113(4), 984–992, 2021.
10. Kurniasari, R., Sefrina, L. R., & Sabrina, S. The impact of on-line food delivery on the nutritional status of work-from-home workers during the COVID-19 pandemic. *Romanian Journal of Diabetes Nutrition and Metabolic Diseases*: 29(4), 457-462, 2022.
11. Ruiz-Roso, M. B., Knott-Torcal, C., Matilla-Escalante, D. C., Garcimartín, A., Sampedro-Nuñez, M. A., Dávalos, A., & Marazuela, M. Covid-19 Lockdown And Changes Of The Dietary Pattern And Physical Activity Habits In A Cohort Of Patients With Type 2 Diabetes Mellitus. *Nutrients*: 12(8), 1–16, 2020.
12. Kurniasari, R., Sabrina, S., Salma, A. N., & Syahbanu, F. Effect of Fish Gelatin on the Characteristics of Horn Plantain Banana (*Musa paradisiaca* fa. *Corniculata*)-based Ice Cream. *International Journal of Food Studies*: 12, 123-131, 2023
13. Sa' pang, M., Sitoayu, L., & Rumana, N. A. Evaluasi Kualitas Diet Pada Penderita Diabetes Melitus Tipe II Di Jakarta Barat. *Window Of Health*: 04(01), 15–22, 2021.
14. Vinke, P. C., Navis, G., Kromhout, D., & Corpeleijn, E. Socio-Economic Disparities In The Association Of Diet Quality And Type 2 Diabetes Incidence In The Dutch Lifelines Cohort. *Eclinicalmedicine*, 19, 100252, 2020.
15. Schultchen, D., Reichenberger, J., Mittl, T., Weh, T. R. M., Smyth, J. M., Blechert, J., & Pollatos, O. Bidirectional Relationship Of Stress And Affect With Physical Activity And Healthy Eating. *British Journal Of Health Psychology*: 24(2), 315–333, 2019.
16. Stults-Kolehmainen, M. A., & Sinha, R. The Effects Of Stress On Physical Activity And Exercise. *In Sports Medicine*: 4(1), 2014.
17. Chacón-Cuberos, R., Zurita-Ortega, F., Olmedo-Moreno, E. M., & Castro-Sánchez, M. Relationship Between Academic Stress, Physical Activity And Diet In University Students Of Education. *Behavioral Sciences*: 9(6), 59, 2019.
18. Isasi, C. R., Parrinello, C. M., Jung, M. M., Carnethon, M. R., Birnbaum-Weitzman, O., Espinoza, R. A., Penedo, F. J., Perreira, K. M., Schneiderman, N., Sotres-Alvarez, D., Van Horn, L., & Gallo, L. C. Psychosocial Stress Is Associated With Obesity And Diet Quality In Hispanic/Latino Adults. *Annals Of Epidemiology*: 25(2), 84–89, 2015.
19. Alisa, F., Despitari, L., Amelia, W., Wahyuni, O., Putri Kentala Cindy A, A. G., & Valentino, P. Hubungan Stress Dengan Kepatuhan Diet Pada Pasien Diabetes Mellitus Tipe 2 Pada Masa Pandemi Covid-19 Di Puskesmas Andalas Padang. *Jurnal Keperawatan Muhammadiyah*: 6(3), 2021.
20. Schlaff, R. A., Baruth, M., Adams, V. J., Goldufsky, T. M., Peters, N. A., Kerr, G., Boggs, A., & Ewald, A. Effects Of A Group-Based Behavioral Intervention On Dietary Behaviors In Older Adults. *Journal Of Aging And Health*: 30(1), 105–117, 2018.
21. Gillman, M. W., Pinto, B. M., Tennstedt, S., Glanz, K., Marcus, B., & Friedman, R. H. Relationships Of Physical Activity With Dietary Behaviors Among Adults. *Preventive Medicine*: 32(3), 295–301, 2001.