



The Relationship between Lifestyle and The Incidence of Abnormal Fasting Blood Sugar Level

Ahmad Mochtar Jamil¹, Yudith Annisa Ayu Rezkita², Muhamad Reza Utama³, Nurul Cholifah Lutfiana⁴, Salsabillah Kemangi Urrachman⁵

^{1,2,3,4}Fakultry of Medicine Universitas Muhammadiyah Surabaya, Surabaya, East Java, Indonesia

⁵Islamic Azad University of Medical Science, Tehran, Iran

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Correspondence:

jachmad_elmi@yahoo.com

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Abstract

Background: This hybrid education forces us to live a sedentary life, but there is a difference between the time before and during the pandemic. This sedentary life event raises the possibility of an increase in fasting blood sugar even at a young age so that it can lead to insulin resistance earlier. Lifestyle patterns are one of the risk factors that are often abused by the community for the occurrence of impaired fasting blood sugar, which also has the potential to become diabetes mellitus.

Objective: This study aims to determine the relationship between lifestyle and the incidence of impaired fasting blood sugar in students of the Faculty of Medicine, University of Muhammadiyah Surabaya.

Method: The study was conducted using an observational analytical method with a cross-sectional study type. A minimum sample of 79 respondents was obtained with a simple random sampling—an instrument to assess lifestyle using the Health Promoting Lifestyle Profile II questionnaire for fasting blood sugar using a glucometer.

Results: The results showed a lifestyle relationship to impaired fasting blood sugar incidence with a significance value of 0.000 and a correlation value of 0.621. This value interprets a strong positive relationship where lifestyle has a unidirectional relationship with fasting blood sugar values.

Conclusion: Based on these data, it is concluded that there is a significant unidirectional relationship between lifestyle and the incidence of impaired fasting blood sugar.

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INTRODUCTION

The incidence of impaired fasting blood sugar is a condition where blood sugar increases from normal but still below the level of diabetes mellitus, which is 100-125 mg/dl¹. The incidence of impaired fasting blood sugar can be established if it includes Impaired Fasting Blood Sugar (GDPT), impaired Glucose Tolerance (IGT), or both¹. Some predictions of the potential for fasting blood sugar events are disrupted, for example, obesity, hereditary type 2 DM, and others¹.

Diabetes mellitus has a high incidence rate and continues to increase by 2%^{1,2}. One of the risk factors is the incidence of impaired fasting blood sugar. Patients with impaired fasting blood sugar events have high-risk factors for diabetes mellitus up to 2-10 times¹. Every year, the prevalence of impaired fasting blood sugar incidence increases worldwide, and it is estimated that there will be 470 million people diagnosed with impaired fasting blood sugar by 2030³.

This hybrid education forces us to become sedentary, but there are differences in sedentary lifestyles before the pandemic and during this pandemic, which forced us not to be able to move like before the pandemic. This sedentary life event raises the possibility of an increase in fasting blood sugar even at a young age so that it can lead to insulin resistance earlier. Some students also eliminate the saturation of online lectures by consuming trending foods and drinks such as boba, coffee, croffles, desserts, and others where the glucose content is very high⁵.

Lifestyle patterns are one of the risk factors that are often abused by the community for the occurrence of impaired fasting blood sugar, which also has the potential to become diabetes mellitus⁶. Lifestyle patterns influence the incidence of disturbed fasting blood sugar¹, but it still does not answer the correlation of sedentary life during the pandemic, which more or less affects the lifestyle patterns of all of us. So, the researcher wanted to analyze the relationship between lifestyle and the incidence of disturbed fasting blood sugar in students of the Faculty of Medicine, University of Muhammadiyah Surabaya.

METHOD

This study is an observational analytical study using a cross-sectional study type. The target population in this study is students of the Faculty of Medicine, University of Muhammadiyah Surabaya. This study received ethical approval to take samples from the Faculty of Medicine, University of Muhammadiyah Surabaya students to become research objects with ethical number 001/KET/II.3/AU/F/2023. The sample in this study is students of the Faculty of Medicine, University of Muhammadiyah Surabaya, with inclusion criteria that must be met, namely as active students or students of the Faculty of Medicine, University of Muhammadiyah Surabaya and willing to be respondents in the study. By following the exclusion criteria, namely students and students who are mentally impaired so that they cannot do activities, post-trauma or lower extremity surgery that requires bed rest so that they cannot move, people with type I diabetes mellitus, moderate or history of taking antidiabetic drugs, metabolic syndrome, and corticosteroids at least within the last one month. Sample

calculation using the Slovin formula and obtained a minimum sample of 79 samples—sampling techniques using simple random sampling techniques. Lifestyle research using the HPLP-II (High Promoting Lifestyle Profile II) questionnaire is divided into four levels, namely bad, medium, good, and very good¹. A bad lifestyle is a lifestyle that has a score range of 52-90 from accumulated questionnaires, a moderate lifestyle has a score range of 91-129, a good lifestyle has a score range of 130-168, a very good lifestyle has a score range of 169-208¹. Assessment of fasting blood sugar using examination with a glucometer and the results are categorized into 2: normal fasting blood sugar and disturbed fasting blood sugar—data correlation analysis using Spearman test with nominal, ordinal data scale. Where $p < 0.05$ indicates two variables have a strong relationship, and $p > 0.05$ indicates that the two variables have a weak or unrelated relationship. The study was conducted directly by distributing questionnaires and fasting blood sugar checks. The study was conducted for one week in March 2023.

RESEARCH RESULTS

Lifestyle

The *Health Promoting Lifestyle Profile II* questionnaire contains 52 items to help determine the quality of a person's lifestyle¹. Here are the respondents' answers to lifestyle variables.

Based on Table 1, most respondents have a lifestyle with a moderate category of as many as 30 people, or 38%. The rest in the good category were 29 people or 36.7%, and the bad category was 20 people or 25.3%.

Fasting Blood Sugar

Fasting blood sugar was taken in respondents with fasting criteria without calorie intake for at least 8 hours⁸. Here are the respondents' answers to fasting blood sugar variables.

Based on the data in Table 2, most respondents with fasting blood sugar variables were categorized as normal, namely 59 people or 74.7%, while respondents with impaired fasting blood sugar amounted to 20 people or 25.3%.

The Relationship Between Lifestyle and Fasting Blood Sugar

The research results on lifestyle and fasting blood sugar checks can be explained in Table 3.

Table 3 shows that respondents with a good lifestyle have most of the normal fasting blood sugar, as many as 27 people, followed by fasting blood sugar disrupted as two people. Respondents with a moderate lifestyle were also dominated by normal fasting blood sugar in as many as 29 people, followed by disturbed fasting blood sugar in as many as one person. Respondents with poor lifestyles mostly had disturbed fasting blood sugar for 17 people, followed by normal fasting blood sugar for three.

Table 3 shows that the Spearman Rank correlation coefficient value is positive at 0.621, which shows a strong relationship between lifestyle and a person's fasting blood sugar value. Based on a significance value of 0.000 ($p = 0.05$), it can be concluded that lifestyle and fasting blood sugar are significantly related.

Table 1 Characteristics of respondents' lifestyle scores

No.	Lifestyle	Frequency	Percentage (%)
1	Good	29	36,7
2	Moderate	30	38,0
3	Bad	20	25,3

Table 2 Characteristics of fasting blood sugar values of respondents

No.	Fasting Blood Sugar	Frequency	Percentage (%)
1	Normal	59	74,7
2	Annoyed	20	25,3

Tabel 3 Spearman Rank Test Analysis

	Fasting Blood Sugar	Lifestyle (HPLP II)			Total	Spearman Rank Test	p-value
		Good	Moderate	Bad			
	Normal	27	29	3	59		
	Annoyed	2	1	17	20	0,621	0,000
	Total	29	30	20	79		

DISCUSSION

The pandemic ended and changed to endemic when this research was carried out. Restrictions on physical activities outside the home have been lifted, and people have begun to return to activities as before⁹⁻¹². The teaching and learning process is still implementing *hybrid*, with most of them having switched to offline, although sometimes online learning is still applied, so this sedentary lifestyle pattern is still carried over⁵.

The method in conducting the study is analytically observational with the type of cross-sectional study which aims to determine whether there is a relationship between lifestyle and impaired fasting blood sugar in students of the Faculty of Medicine, University of Muhammadiyah Surabaya, and data collection is carried out at one particular time so that it uses

the type of cross-sectional study. The sample was taken using a simple random sampling technique, where respondents were randomly drawn from the entire population, which included inclusion. The minimum sample needed was obtained from the Slovin formula with a minimum number of 78 people, and the implementation of the sample obtained exceeded the minimum sample of 79 people. The sampling instrument uses the HPLP-II questionnaire to measure lifestyle and fasting blood sugar examination with a glucometer to assess normal or interrupted fasting blood sugar.

According to HPLP-II, lifestyle is divided into four levels: bad, medium, good, and very good^{1,13}. A bad lifestyle is a lifestyle that has a score range of 52-90 from accumulated questionnaires, a moderate lifestyle has a score range of 91-129, a good lifestyle has a score range of

130-168, a very good lifestyle has a score range of 169-208¹.

Monotonous activities from morning to evening with a busy daily schedule make students of the Faculty of Medicine, University of Muhammadiyah Surabaya, classified as having low physical activity intensity or a sedentary lifestyle.

The results of the Spearman Rank correlation test found a relationship between lifestyle and the incidence of impaired fasting blood sugar, with a significance value of 0.000, which means there is a strong correlation due to the significance value of <0.05. The correlation value is obtained at 0.621, which shows a positive correlation relationship. A positive correlation means that lifestyle has a proportional relationship with impaired fasting blood sugar incidence; the higher the lifestyle score value is followed, the more normal fasting blood sugar value^{2,11,14,15}.

Lifestyle can affect fasting blood sugar because lifestyle has several important factors, including physical activity^{6,7,11,16}. Physical activity is one part of a lifestyle that can reduce the risk of non-communicable diseases (NCDs)¹⁷. The incidence of impaired fasting blood sugar is a phase leading to diabetes mellitus, which includes non-communicable diseases, and lack of physical activity is one of the risk factors¹. Body secretions slow down due to less physical activity, so fat accumulates in the body, and excess weight leads to potential diabetes mellitus^{1,5,18,19}. Physical activity can activate the control and regulation of blood sugar levels because physical activity requires glucose for muscle cells so that blood sugar levels drop (blood sugar levels will increase when physical

activity decreases because blood sugar recirculates to the blood^{20,21}.

In a study conducted in Saudi that examined the relationship of HPLP-II in Saudi medical students, a very good relationship was obtained from gender categories, physical activity, and interpersonal relationships^{2,7,14,22}. It is very important to plan and prioritize HPLP-II in improving Saudi medical students' health, lifestyle quality, and health promotion in the community⁷.

There is another study in Saudi where 160 people diagnosed with pre-diabetes were given treatment in the form of controlling their lifestyle, especially the intake of nutrients and physical activity for approximately six months. The results obtained significantly increased fasting blood sugar, and dietary habits and physical activity significantly influenced the test results⁶.

Another study by the Guatemalan and Central American Medical Center found that despite improving lifestyle and dietary habits, it did not significantly affect them. After all, diabetes mellitus and pre-diabetes have become epidemics because the majority of Guatemalan and Central American populations have hereditary offspring²².

In this study, data were obtained in the form of fasting blood sugar values measured by examination using a glucometer, and the results were categorized into 2, namely normal fasting blood sugar and disturbed fasting blood sugar. Measurement of fasting blood sugar data on students of the Faculty of Medicine, University of Muhammadiyah Surabaya, was obtained by as many as 79 respondents. The data was dominated by normal fasting blood sugar, which

was 59 respondents, and followed by impaired pusa blood sugar data by as many as 20 respondents. In line with research⁹ on students of the Faculty of Medicine, Andalas University, the results of the study were dominated by respondents with normal blood sugar levels as many as ten respondents, followed by fasting blood sugar data disrupted as many as eight respondents, and seven respondents categorized as diabetes.

In the second variable data in this study, lifestyle scores were assessed based on 52 question items seen with six subscales of health responsibility (9 items), spiritual growth (9 items), physical activity (8 items), interpersonal relationships (9 items), nutrition (9 items), and stress management (8 items). The results of lifestyle research on students of the Faculty of Medicine, University of Muhammadiyah Surabaya, are 30 people in the medium lifestyle category, 29 people in the good lifestyle category, and 20 people in the bad lifestyle category. The data interprets that most students are categorized as having a moderate lifestyle. This result aligns with research conducted by^{6,7,11,22,23}, namely that a moderate lifestyle with an average of 127.9 dominates the lifestyle of medical students in Saudi Arabia.

Data obtained from research on the Faculty of Medicine, University of Muhammadiyah Surabaya students, with lifestyle variables and fasting blood sugar, show a relationship. This result is shown by the research results on students with moderate and good lifestyles who have normal fasting blood sugar values, while students with bad lifestyles have abnormal or disturbed fasting blood sugar values.

The advantage of this study is that the data obtained from filling out the Health Promoting

Lifestyle Promotion II questionnaire can analyze specifically which subscales affect respondents' lifestyles. The sampling method in this study uses random sampling, which is a randomly selected sample from the existing population so that it can describe the population of students of the Faculty of Medicine, University of Muhammadiyah Surabaya.

The weakness of this study is that it is necessary to condition and ensure enough respondents are cooperative to fast at least 8 hours before fasting blood sugar checks, so researchers must follow up with respondents one by one. The considerable question points on the Health Promoting Lifestyle Promoting II questionnaire also made respondents lazy to fill in nicely. Unlike the cohort method, cross-sectional research methods are less able to define the influence of variables on respondents.

The bias in this study is the value of fasting blood sugar, which is caused by not only a bad lifestyle but also the presence of hereditary diabetes mellitus or a history of consumption of antidiabetic drugs, metabolic syndrome, and corticosteroids^{3,14,18,24}. In addition, lifestyle, mainly sedentary physical activity, in addition to a busy lecture schedule, can also be caused by someone who is mentally impaired or post-traumatic or surgery that requires bed rest so that they cannot move. These criteria were excluded from research respondents to prevent bias in this study.

One limitation of this study is that respondents are afraid of needles for fasting blood sugar checks, so researchers need to persuade and seduce respondents to be still able to follow the study by approved procedures.

CONCLUSION

The population character of impaired fasting blood sugar is dominated by a bad lifestyle of 17 people, a good lifestyle of 2 people, and a moderate lifestyle of 1 person. In students of the Faculty of Medicine, University of Muhammadiyah Surabaya, most respondents were categorized as having moderate lifestyles as much as 38%, followed by good lifestyles 36.7% and bad lifestyles 25.3%. Fasting blood sugar in medical school students obtained the most normal fasting blood sugar categories at 74.7%, followed by impaired fasting blood sugar at 25.3%. The relationship between lifestyle and fasting blood sugar in students showed a strong and significant positive relationship between lifestyle and impaired fasting blood sugar in students of the Faculty of Medicine, University of Muhammadiyah Surabaya.

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