

Relationship Between Physical Activity and Sedentarily Activity with Nutritional Status for Adults 20-39 years old in Malang

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ABSTRACT

Nutritional problems are a public health problem that has been addressed as a global problem due to changes in lifestyle, such as decreased physical activity and the occurrence of a sedentary lifestyle. This study aimed to determine the relationship between physical activity and a sedentary lifestyle with adult nutritional status based on Body Mass Index. Analytical Observational Research with a cross-sectional approach on 380 adults aged 20-39 years in Malang City was conducted using the Global Physical Activity questionnaire and the Sedentary Behaviour Questionnaire. Bodyweight and height were measured as primary data. The levels of physical activity were low, medium, and high. Meanwhile, a sedentary lifestyle is divided into low, medium, and high categories. The nutritional status is measured with Body Mass Index (BMI). Data were analyzed by Kruskal-Wallis and Somers'D with a value of < 0.05 considered significant. The results showed the relationship between physical activity and nutritional status with a probability value of $\text{Sig} = 0.002$. The relationship between a sedentary lifestyle and nutritional status showed a probability value of $\text{Sig} = 0.000$. It indicates a significant relationship between physical activity and a sedentary lifestyle with adult nutritional status in Malang City. The correlation test results using Somer's D showed that the strength of the relationship between variables was very weak. There was a significant relationship between physical activity and a sedentary lifestyle with the nutritional status of adults in Malang City.

INTRODUCTION

Nutritional problems are a public health problem that has not been resolved globally. The impact is tremendous, not only on morbidity, disability, and death but also on the formation of quality human resources. According to the Indonesian Ministry of National Development Planning (2019), the problem of undernutrition tends to be faced by developing countries, while developed countries mostly experience the problem of excess nutrition (1). However, some developing countries face a dual nutritional problem, a combination of both undernutrition and overnutrition. Overnutrition is considered an early signal of the emergence of degenerative diseases that occur in developed and developing countries. Based on the World Health Organization (2018) data, more than 1.9 billion adults are overweight. Overnutrition can lead to degenerative diseases like diabetes, heart disease, hypertension, and cancer. Overnutrition is the fifth leading cause of death in the world. There were 2.8 million adults die of overweight and obesity every year (2).

Indonesia is a developing country, which has still dealt with the nutritional problem. Indonesia must be aware of the emergency of over dietary issues in the form of obesity. Based on Baseline Indonesia Health Research data in 2018, the prevalence of nutritional status of the adult Indonesian population is classified as thin (8.9%), overweight (13.6%), and obese (21.8%). Meanwhile, East Java shows the prevalence of underweight adults (9.3%), overweight adults (13.7%), and obesity (22.4%). The prevalence of underweight adults in Malang (10.19%), overweight adults (13.24%), and obesity (29.17%). From this data, the number of overweight and obesity in Indonesia is still high (3).

Many direct or indirect factors can affect nutritional statuses like food consumption, health condition, physical activity, food production, economic status, people's knowledge, and lifestyle (4). Healthy people tend to do regular physical activity. Physical activity plays a role in balancing the flow of nutrients into and out of the body because the physical activity requires energy consumption, thus helping to improve the body's metabolic system, including nutrient metabolism (5). However, approximately 33.5% of Indonesia's ten-year-old population lacked exercise (6). While in East Java province, 26.1% have less activity (7). A study was found that there was a relationship between a sedentary lifestyle and nutritional status. This study shows that excessive sitting activity more than 10 hours a day can increase the risk of overnutrition. Lack of physical activity is more likely to lead to more nutrition than adequate physical exercise (8).

Early adulthood begins at the age of 18 years to 40 years. People have completed body growth in this age period and are ready to act their role in society. The growth process in the early adulthood age the growth stops, but the productivity increase where the schedule of activities starts to get busy such as school or work activities so that at this age, there is a vulnerability to an imbalance in nutritional status (9). When adults get older, the metabolism that occurs in the body decreases and there will be biological changes, decreased muscle function and increased levels of fat in the body. When metabolism decreases, it makes a person less active in carrying out physical activities, causing poor nutritional status (10).

METHOD

This study is an analytical observational study using a cross-sectional design to determine the correlation of physical activity and a sedentary lifestyle with adult nutritional status in Malang City (11). This research was conducted in September-October 2021 and has received ethical approval from the ethics committee of FK UNISMA with the number 023/LE.001/IX/04/2021. The population in this study was 313,492 people, the adult population of 20-39 years who live in Malang City. The sampling technique was the purposive sampling method. The minimum number of respondents measured by the Lemeshow formula was 380 people. The inclusion criteria in this study were [1] individuals aged 20-39 years; [2] individuals who are not sick; [3] individuals who do not have a chronic disease; [4] individuals who are willing to become respondents and can read and write to fill out the questionnaire. The exclusion criteria consisted of [1] individuals with congenital and structural defects in certain body parts; [2] individuals who are not present in the measurement of height and weight (Figure 1).

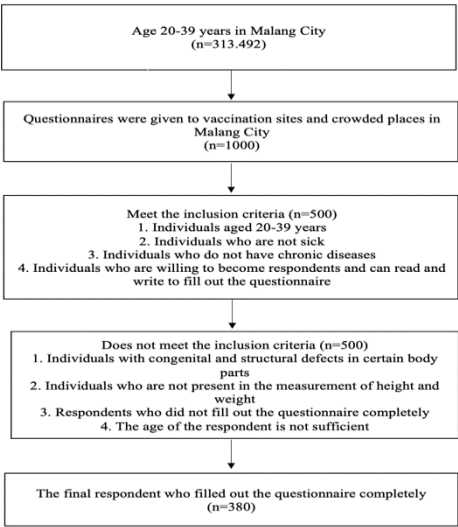


Fig. 1.Sampling research flowchart

The research instruments were the Global Physical Activity Questionnaire (GPAQ) and the Sedentary Behaviour Questionnaire (SBQ). Those delivered via online questionnaire through Google Form. Data collection was carried out for 30 minutes and began with an explanation regarding informed consent and instructions for filling out the questionnaire. The filling of the questionnaire is monitored directly to see the concentration of participants, and if any questions are not straightforward can be asked to the researcher. In addition, researchers measured body weight and height directly by using weight scales (xiaomi) and stature meter.

The level of physical activity was measured using the Global Physical Activity Questionnaire (GPAQ). It is divided into 3 categories: [1] low category = $600 < \text{MET}$; [2] medium category = $3000 > \text{MET} \geq 600$; and [3] high category = $\text{MET} \geq 3000$ ((12)) The level of sedentary lifestyle was measured using a questionnaire *Sedentary Behavior Questioner* (SBQ), the level sedentary lifestyle is divided into 3 categories: [1] low category = < 21 hours; [2] medium category = ≥ 21 hours or < 35 hours / week; and [3] high category = ≥ 35 hours/week. Test the validity and reliability of the

SBQ questionnaire with the Cronbach Alpha coefficient = 0.831 and $r = 0.361$, which means that the questionnaire is valid and reliable ((13)). Nutritional status in adults is measured by looking at nutritional status based on body mass index. Body mass index is divided into four categories, very skinny $<17.0 \text{ kg/m}^2$; skinny $17 - 18.4 \text{ kg/m}^2$; normal $18.5\text{-}25.0 \text{ kg/m}^2$; overweight $25.1\text{-}27.0 \text{ kg/m}^2$; and obese $>27.0 \text{ kg/m}^2$ (7).

The independent variable in this study is physical activity and sedentary activity. The dependent variable is nutritional status. Analysis of research data using univariate and bivariate analysis. The Kruskal Wallis Relationship Test and the Somer's D test with $\alpha < 0.05$ were used to analyzing the data. Researchers used the Statistical Package for the Social Sciences (SPSS) version 25 for data processing and statistical analysis. This statistical analysis aims to determine the relationship, the significance, and the strength of the relationship between variables.

RESULTS AND DISCUSSION

This study involved 380 respondents who live in Malang City, with the sample distribution coming from adults aged 20-39 years in Malang City. The distribution of respondents' locations are from Lowokwaru District obtained 170 respondents (44.7%), Klojen District 49 respondents (12.9%), Sukun District 58 respondents (15.3%), Blimbing District 63 respondents (16.6%) and Kedungkandang District 40 respondents (10.5%). Characteristics of respondents are distinguished by age, last education, occupation, and gender. From all respondents, the dominant age is 20-24 years. In the distribution obtained at the previous level of education, the majority have higher education (53%). For distribution based on employment status, it was found that respondents were not working. While the distribution is based on gender, the number of women is 20% more than men (Table 1).

Table 1. Characteristics of Respondents*

Characteristics of respondents	n (%)
Age (years)	
20-24	266 (70%)
25-29	66 (17%)
30-34	35 (9%)
35-39	13 (4%)
Previous Education	
Junior High School	1 (0.3%)
Senior High School	177 (46.6%)
S1/Equivalent	195 (51.3%)
S2/Equivalent	7 (1.8%)
Work Status	
Work	142 (37,3%)
Does not work	238 (62,7%)
Gender	
Man	156 (40%)
Woman	224 0%)

* The characteristics of the respondents obtained from the Global Physical Activity Questionnaire and *Sedentary Behavior Questionnaire*

Physical Activity Level, Sedentary Lifestyle and Nutritional Status by Age, Last Education, Occupation and Gender

Based on Table 2, the respondents' physical activity was grouped based on the physical activity category. There are three categories of physical activity: low, moderate, and high physical activity—measurement of physical activity using the amount of Metabolic Equivalent of Task (MET). Low physical activity expends energy per week of less than 600 MET. Meanwhile, the medium category spends 600-3000 MET energy per week, and the high category expends energy per week of more than 3000 MET. The majority of respondents aged 25-34 years old have high physical activity, while those aged 35-39 years old have relatively low physical activity, and those aged 20-24 years old have moderate physical activity.

Table 2. Assessment of Physical Activity and Sedentary Lifestyle

Characteristics of Respondents	Physical Activity			Sedentary Lifestyle		
	High	Moderate	Low	High	Moderate	Low
Age (years)						
20-24	100(26,3%)	86(22,6%)	80(21,1%)	182(47,9%)	51(13,4%)	33(8,7%)
25-29	33(8,7%)	16(4,2%)	17(4,5%)	45(11,8%)	15(3,9%)	6(1,6%)
30-34	12(3,2%)	7(1,8%)	16(4,2%)	27(7,1%)	6(1,6%)	2(0,5%)
35-39	2(0,5%)	3(0,8%)	8(2,1%)	6(1,6%)	6(1,6%)	1(0,3%)
Previous Education						
Junior High School	0(0%)	0(0%)	1(0,3%)	1(0,3%)	0(0%)	0(0%)
Senior High School	68(17,9%)	53(13,9%)	56(14,7%)	120(31,6%)	36(9,5%)	21(5,5%)
S1/Equivalent	75(19,7%)	57(15%)	63(16,6%)	132(34,7%)	42(11,1%)	21(5,5%)
S2/Equivalent	4(1,1%)	2(0,5%)	1(0,3%)	7(1,8%)	0(0%)	0(0%)
Work Status						
Office/Private Employees	30(7,9%)	16(4,2%)	25(6,6%)	53(13,9%)	12(3,2%)	6(1,6%)
Civil Servant	8(2,1%)	6(1,6%)	4(1,1%)	14(3,7%)	4(1,1%)	0(0%)
Entrepreneur	32(8,4%)	9(2,4%)	12(3,2%)	37(9,7%)	9(2,4%)	7(1,8%)
Housewife	1(0,3%)	1(0,3%)	4(1,1%)	2(0,5%)	4(1,1%)	0(0%)
Student	71(18,7%)	72(18,9%)	70(18,4%)	136(35,8%)	48(12,6%)	29(7,6%)
Unemployment	5(1,3%)	8(2,1%)	6(1,6%)	18(5%)	1(0%)	0(0%)
Gender						
Man	69(18,2%)	45(11,8%)	42(11,1%)	110(28,9%)	24(7,4%)	18(4,7%)
Woman	78(20,5%)	67(17,6%)	79(20,8%)	150(39,5%)	50(13,2%)	24(6,3%)

In a sedentary lifestyle, there are three categories, namely low, medium, and high categories. A sedentary lifestyle is calculated based on the time (hours/week) the respondent performs sedentary activities. Respondents who spent <21 hours/week included respondents in the low category. Respondents in the medium category spent 21-35 hours/week, while respondents in the high category spent >35 hours/week. This study shows that respondents aged 20-24 years old are the majority group having a high sedentary lifestyle (48% of the total number of respondents). The respondents of those ages are primarily students or a worker. This result was due to the Covid-19 pandemic causing all work and educational activities to be carried out online. As a result, respondents spend a lot of time sitting and in front of electronic gadgets at home.

Based on the characteristics of work status, this study found that 71 people work as office or private employees, 18 people work as civil servants, 53 people work as entrepreneurs, six people as housewives, 213 people as students, and 21 people as unemployed. From the physical activity assessment, respondents who work in an indoor office base have a lower level of physical activity than people who work outdoors. It is because respondents with office-based professions and students spend more time sitting in front of the computer for a long time. On the contrary, respondents who work outside the room tend to have more physical activity. So, this affects the measurement results of a sedentary lifestyle, which shows that people who work in offices tend to have a higher sedentary lifestyle than people who work outdoors. This situation also affects the nutritional status of the respondents in this study. The respondents who work in the room tend to get overnutrition due to a lower level of physical activity and a higher sedentary lifestyle (16% of the population) (Table 3).

Respondents' nutritional status is measured by calculating the Body Mass Index (BMI) based on body weight and height data. The majority of respondents in this study are in normal BMI. In contrast, respondents who are overweight (obese) are 76 people, and the rest have poor nutritional status, with 33 thin respondents and very skinny nine people dominated by female respondents. This study showed that female respondents have a more balanced nutritional status than male respondents.

Table 3. Assessment of Nutritional Status

Characteristics of Respondents	Nutritional Status			
	Very Skinny	Skinny	Normal	Overweight
Age (years)				
20-24	6(1,6%)	22(5,8%)	189(59,7%)	49(12,9%)
25-29	2(0,5%)	10(2,6%)	40(10,5%)	14(3,7%)
30-34	1(0,3%)	1(0,3%)	25(6,6%)	8(2,1%)
35-39	0(0%)	0(0%)	8(2,1%)	5(1,3%)
Previous Education				
Junior High School	0(0%)	0(0%)	0(0%)	1(0,3%)
Senior High School	6(1,6%)	16(4,2%)	117(31%)	38(10%)
S1/Equivalent	3(0,8%)	15(3,9%)	140(36,8%)	37(9,7%)
S2/Equivalent	0(0%)	2(1%)	5(1%)	0(0%)
Work Status				
Office/Private Employees	3(0,8%)	7(1,8%)	43(11,3%)	18(4,7%)
Civil Servant	0(0%)	1(0,3%)	12(3,2%)	5(1,3%)
Entrepreneur	0(0%)	4(1,1%)	35(9,2%)	14(3,7%)
Housewife	0(0%)	0(0%)	6(1,6%)	0(0%)
Student	5(1,3%)	18(4,7%)	151(39,7%)	39(10,3%)
Unemployment	1(0,3%)	3(0,8%)	15(3,9%)	0(0%)
Gender				
Man	2(0,5%)	5(1,3%)	102(26,8%)	47(12,4%)
Woman	7(1,8%)	28(7,4%)	160(42,1%)	29(7,6%)

The analysis using the Kruskal Wallis test between physical activity and the nutritional status of adults in Malang City showed a significant (significant) relationship between physical

activity and nutritional status. It was indicated by a significant p-value of 0.002 (p-value sig. <0.05). Furthermore, it showed that with normal nutritional status (normal BMI) obtained many respondents with high levels of physical activity. Meanwhile, respondents with obese status were found with low physical activity levels. It shows a significant relationship between physical activity and nutritional status (Table 4).

It is known based on the data obtained by respondents in the high physical activity category with 147 people with nutritional status, 5 people with very thin nutritional status, 15 people with underweight nutritional status, 106 people with normal nutritional status, and 21 people with overweight status. There were 112 people with nutritional status, one person with very thin nutritional status, 12 underweight nutritional status, 79 people with normal nutritional status, and 20 people with more nutritional status for the moderate physical activity category. And for low physical activity with 121 people with nutritional status, 3 people are skinny, 6 people are thin, 77 people are normal, and 35 people are fat. Based on these data, respondents with high to moderate physical activity have normal nutritional status on average, while respondents with low physical activity show that many respondents experience excess nutrition. The higher the physical activity carried out; the more energy is needed to avoid extra energy in the body. On the other hand, in this study, it was found that respondents with low physical activity had a high category of nutritional status. It was due to spending less energy because they did not do much physical activity, which caused the accumulation of excess energy in the body, which resulted in nutritional imbalance. So if physical activity is low, the risk of obesity will increase (14). Physical activity affects only 30% of energy expenditure in normal weight people, but becomes very important in people with obesity. Besides being very important in burning calories, exercise also plays a role in regulating normal metabolism (15).

Table 4. Statistical analysis of the Relationship between Physical Activity and Sedentary Lifestyle with Nutritional Status

Aktivitas Fisik	Nutritional Status					p-value
	Very Skinny	Skinny	Normal	Overweight	n(%)	
High	5	15	106	21	147 (32%)	0,002*
Moderate	1	12	79	20	112 (29%)	
Low	3	6	77	35	121 (39%)	
	9(2%)	33(9%)	262(69%)	76(20%)	380(100%)	
Sedentary Lifestyle						
High	9	25	185	41	260 (68%)	0,000*
Moderate	0	5	57	16	78 (21%)	
Low	0	3	20	19	42 (11%)	
	9(2%)	33(9%)	262(69%)	76(20%)	380(100%)	

^aThe results of the Kruskal Wallis test,
* Significant if the p-value <0.05 (H0 is rejected and H1 is accepted)

The relationship between physical activity and nutritional status has been empirically proven. Every human needs regular physical activity because the body is designed to move. The

Strategy for the Application of Diet and Physical Activity (2012) states that physical activity is considered sufficient if a person does a physical activity or exercises for 30 minutes every day at least 3-5 days a week. Even though it looks like strenuous physical activity, getting 60-90 minutes of physical activity per day is enough to avoid weight gain. This study is also in line with research conducted (16); it is known that most of the respondents with light physical activity amounted to 33.9%, who did a moderate physical activity with a total of 36.5%. Around 29.6% did a heavy physical activity. Respondents who do moderate physical activity have 0.4 times less risk of obesity than those who do light physical activity. Respondents who do strenuous physical activity are 0.6 times less likely to be obese than those who do light physical activity (16).

Research conducted (17) also mentioned that the level of physical activity carried out by individuals does affect nutritional status. On average, respondents with low physical activity tend to have more nutritional status, and respondents with moderate physical activity have normal nutritional status. However, there are also those with underweight nutritional status (17). In a study conducted (18) on junior high school teachers showed no relationship between physical activity and the nutritional status of the respondents. It is because physical activity is a long-term influence on nutritional status

The results of the Kruskal Wallis test for the level of a sedentary lifestyle and the level of nutritional status obtained p values = 0.000. Many respondents were in a high level of a sedentary lifestyle. However, it turns out that despite the high sedentary lifestyle, there are still many who are normal, as many as 185 people and 45 people who are obese. It shows a significant relationship between a sedentary lifestyle and adult nutritional status in Malang City (**Table 4**).

The data obtained by respondents with a high sedentary lifestyle category with 260 people consists of 9 people with very skinny nutritional status, 25 people are skinny, 186 people with normal nutritional status, and 41 people are obese. For the moderate sedentary lifestyle with 78 people with details of no nutritional status very skinny, 5 people are skinny, 56 people with normal nutritional status, and 16 people are overweight. While in the low sedentary lifestyle group with 42 people with details of none having very thin nutritional status, 3 people with underweight nutritional status, 20 people with normal nutritional status, and 19 people with overweight status. From these data, respondents with a sedentary lifestyle tend to have more nutritional status, and on average, respondents with a mild to moderate sedentary lifestyle have normal nutritional status. However, if you look at the results, it turns out that even though many have a high BMI, there are still many normal lifestyles. In this study, the researchers did not specifically examine physical activity based on the level of exercise. Still, researchers measured the overall activities carried out by respondents daily. In this study, most respondents with a high sedentary lifestyle category were students and office workers.

This statement is reinforced (19) which shows that office workers are a population that tends to have a high sedentary lifestyle. Research conducted (8) found that respondents who did

sedentary activities sitting for more than 8 hours per day had a risk 2 times greater than those who did not. On research (20) conducted on government employees, there is a relationship between a sedentary lifestyle with the incidence of overnutrition. This research is also in line with the study conducted (21) which states that a high sedentary lifestyle causes overweight (overweight) and vice versa if a low sedentary lifestyle, BMI is relatively normal.

The correlation test results with (Somer's D) showed that there was a correlation between physical activity and a sedentary lifestyle with adult nutritional status. However, the value of *r* between physical activity and nutritional status is -0.121 (*r* table 0.00-0.25 = very weak), which means the correlation is weak and not in the same direction. The value of *r* is not unidirectional, meaning it has an inverse relationship—the higher the physical activity, the lower the risk of impaired nutritional status. Meanwhile, the value of *r* between sedentary lifestyle to nutritional status is -0.178 (*r* table 0.00-0.25 = very weak), which means that the correlation is weak and not in the same direction even though there are significant differences. The value of *r* is not unidirectional, meaning it has an inverse relationship. Meanwhile, for a sedentary lifestyle, the lower the sedentary lifestyle, the higher the chances of a balanced nutritional status.

Table 5. Correlation Analysis of Physical Activity and Sedentary Lifestyle with Nutritional Status

Independent Variable		Nutritional Status
Physical Activity	r-value	-.121
	p-value	0.002
Sedentary Lifestyle	r-value	-0.178
	p-value	0.000

^aSomer's D test analysis (value of *r* 0.00-0.25 = very weak, *r*-value 0.26-0.50 = moderate, *r*-value 51-0.75 = strong, *r*-value 0.76-0.99 = very strong, *r*-value 1, 00 = perfect.

The results of the correlation with (Somer's D) show that there is a correlation between the two independent variables (physical activity and sedentary lifestyle) and the dependent variable (adult nutritional status). The correlation test conducted on the physical activity variable (independent variable) with nutritional status (the dependent variable) obtained an *r*-value of -0.121, which is included in the category of very weak correlation (*r* table 0.00-0.25 = very weak). It happens because other factors can affect the nutritional status of adults, namely knowledge, variety of food, dietary behavior, self-image, stress levels, and sleep patterns. A negative *r* value indicates that the correlation is the inverse (not unidirectional) if the high physical activity causes a decrease in the risk of impaired nutritional status balance.

The results of the correlation test for a sedentary lifestyle (independent variable) with adult nutritional status (dependent variable) got a score of *r* value-0.178, which indicates a very weak correlation (*r* table 0.00-0.25 = very weak). It can happen because a sedentary lifestyle is related to nutritional status, but there are other factors, namely knowledge, food variety, dietary behavior, self-image, stress levels, and sleep patterns. A negative *r* value indicates that the direction of the correlation is inverse (not in the same order), so if a low sedentary lifestyle causes the chances of a balanced nutritional status to increase.

CONCLUSION

The analysis results in this study concluded that there is a significant relationship between physical activity and sedentary lifestyle with the nutritional status of adults 20-39 years old in Malang City. In comparison, the correlation between physical activity and a sedentary lifestyle with the nutritional status of adults 20-39 years old in Malang City was very weak. A sedentary lifestyle gives a higher correlation than physical activity on the nutritional status of adults 20-39 years old in Malang City. Based on these results, some suggestions can be made as follows, such as to conduct further research by measuring more specific physical activity such as the relationship between sports activities and nutritional status.

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