

**SEDENTARY PHYSICAL ACTIVITY WITH BODY MASS INDEX AMONG  
PRECLINICAL STUDENTS AT THE FACULTY OF MEDICINE OF WIDYA  
MANDALA CATHOLIC UNIVERSITY OF SURABAYA**

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**ABSTRACT**

**Introduction:** The percentage of individuals with a body mass index (BMI) above average increases yearly. Sedentary physical activity is one of the factors that may cause an increase in BMI. IMT is a statistical indicator that applies an individual's weight and height to determine weight categories at all age groups. Sedentary physical activity is an activity in a conscious state that only expends energy of  $\leq 1.5$  Metabolic Equivalent of Task (MET).

**Purpose:** To determine the correlation between sedentary physical activity and BMI among preclinical students at the Faculty of Medicine, Widya Mandala Catholic University of Surabaya.

**Methods:** This was an observational analytical study with a cross-sectional design. The samples were selected through simple random sampling. The data source for this study was derived from primary data in the form of interviews using the International Physical Activity Questionnaire (IPAQ) and direct measurement of 159 students.

**Result:** 41.5% of students had normal BMI and 33.3% had sedentary physical activities. Based on the results of the Spearman correlation test, it was found that there was a strong and significant relationship between sedentary physical activity and body mass index (p value=0.000 with  $r=0.641$ ).

**Conclusion:** There was a significant positive correlation between sedentary physical activity and BMI, which indicated that the higher the sedentary physical activity, the higher the BMI. Such a relationship suggested that sedentary physical activity had a positive role in the incidence of overweight and obesity.

**Keywords:** *sedentary physical activity, body mass index (BMI), metabolic equivalent of task (MET), international physical activity questionnaire (IPAQ)*

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## INTRODUCTION

The percentage of individuals with a body mass index (BMI) above normal increases yearly. One-third of adults in Indonesia are overweight or obese.<sup>1</sup> Based on 2018 Basic Health Research data (Riskesmas), the percentage of overweight adults continued to increase. In 2007 it was recorded by 8.6%, which increased to 11.5% in 2013 and 13.6% in 2018. The percentage of obesity in adults increased by 161.3%, from 2007-2018 to 21.8%. North Sulawesi ranked the highest percentage by 30.2%. East Java had a percentage of overweight by 13.75% and obesity in adults by 22.37%. Surabaya ranked the 7<sup>th</sup> highest percentage of obesity and the 8<sup>th</sup> highest percentage of overweight from all over East Java by 28% and 15.18%, respectively.<sup>2</sup>

Obesity can cause various adverse effects which may lead to certain diseases such as diabetes, dyslipidemia, osteoarthritis, and various types of cancer.<sup>3,4,5,6</sup> Obesity can also cause psychological and emotional disorders. Psychological and emotional disorders may further cause decreased self-confidence, anxiety, depression, and even suicide attempts in certain case.<sup>7</sup>

Several factors play a role in increasing and decreasing BMI, namely gender, marital status, income, and age.<sup>8</sup> Men tend to have a lower BMI than women because of differences in body composition. Furthermore, men have a body composition with a higher level of fat-free mass than women, while women have a body composition with a higher level of fat mass than men.<sup>9</sup> In a study conducted by Sattar in 2018, it was found that 22.9% of respondents in the obese group were married and 6.6% of respondents were unmarried.<sup>8</sup> Based on this study, adults who were married had a higher BMI than unmarried adults. In addition, it was also found that an increase in economic status due to high income tended to encourage changes such as changes in diet which could further impact BMI.<sup>10</sup> Regions with

higher minimum wages tended to have lower rates of obesity.<sup>11</sup> The process of aging affects body composition such as a decreased muscle mass and redistribution of fat to the abdomen and visceral organs.<sup>12</sup> There is a gradual increase in body fat, especially visceral fat tissue, with age, so older adults have body composition with a higher level of fat compared to younger adults.<sup>13</sup>

A study conducted by Kim and colleagues in 2020 found that more time spent doing moderate physical activity could result in a decrease in BMI.<sup>14</sup> Another study conducted in 2017 concluded that excessive sedentary physical activity resulted in an increase in BMI among adults.<sup>15</sup> Individuals with sedentary physical activity generally move in a lying or sitting position, to have a very low energy expenditure which increases BMI. However, based on 2018 Basic Health Research data, several cities such as Jember (37.7%), Sidoarjo (42.89%), Pasuruan (43.87%), and Bangkalan (40.63%) had a higher proportion of sedentary activity than Mojokerto which is a city with the highest prevalence of obesity (32.13%) in East Java.<sup>2</sup>

Based on the background, obesity is considered a problem that has been existing for a long time and the number is increasing every year. Based on 2018 Basic Health Research data, cities with the highest proportion of sedentary activity were not cities with the highest percentage of obesity. Therefore, researchers are interested in determining the relationship between sedentary physical activity and BMI among preclinical students at the Faculty of Medicine of Widya Mandala Catholic University of Surabaya.

## METHODS

This was an observational analytical study with a cross-sectional design. Data collection from respondents was only conducted once during the study.

The sample for this study were students of the Faculty of Medicine, Widya Mandala Catholic University of Surabaya,

class of 2019-2021 based on the inclusion and exclusion criteria. The samples were selected through simple random sampling. The study was conducted from August - October 2022. Data were collected by measuring body weight and height, as well as through direct interviews. Before being involved in the study, respondents provided consent by filling out the informed consent form. Furthermore, their height and weight were measured using the OneMed microtome and Kris's digital stepping scales, respectively. The further step was an interview using the IPAQ-SF questionnaire to assess the level of physical activity.

## RESULT

**Table 1: Distribution of Respondents by BMI**

BMI	Class			Total (n)	%
	2019 (n)	2020 (n)	2021 (n)		
Underweight	2	5	5	12	7.6
Normal	20	22	24	66	41.5
Overweight	10	9	7	26	16.4
Obesity class I	14	14	8	36	22.6
Obesity class II	9	5	5	19	11.9
<b>Total</b>	<b>55</b>	<b>55</b>	<b>49</b>	<b>159</b>	<b>100</b>

Table 1 presents the distribution of 159 respondents from the Faculty of Medicine, Widya Mandala Catholic University of Surabaya. Most of the respondents were from the class of 2019 and 2020 as many as 55 respondents, respectively. In addition, table 1 also shows the distribution of respondents by the classification of BMI. 12 respondents (7.6%) were in the underweight category, 66 respondents (41.5%) were in the normal category, 26 respondents (16.4%) were in the overweight category, 36 respondents (22.6%) were in the Obesity class I category, and 19 respondents (11.9%) were in the Obesity class II category. Most of the respondents were in the normal category and the fewest respondents were in the underweight category by 12 respondents.

**Table 2: Distribution of Respondents by Sedentary Physical Activity**

Sedentary Physical Activity	Number (n)	Percentage (%)
Non-Sedentary	106	66,7
Sedentary	53	33,3
<b>Total</b>	<b>159</b>	<b>100</b>

Table 2 presents the distribution of respondents by sedentary physical activity category. 106 respondents (66.7%) were in the non-sedentary category and 53 respondents were in the sedentary category (33.3%).

**Table 3: Distribution of Underweight by Sedentary Physical Activity**

BMI	Sedentary Physical Activity	Number (n)	Percentage (%)
Underweight <18.5 kg/m <sup>2</sup>	Non-Sedentary	12	100
	Sedentary	0	0
	<b>Total</b>	<b>12</b>	<b>100</b>

Table 3 presents the distribution of respondents in the underweight category. 12 respondents (100%) were classified in the underweight category with no sedentary physical activity and there was no respondent (0%) who was classified in the underweight category with had sedentary activity.

**Table 4: Distribution of Normal Weight by Sedentary Physical Activity**

BMI	Sedentary Physical Activity	Number (n)	Percentage (%)
Normal Weight 18.5-22.9 kg/m <sup>2</sup>	Non-Sedentary	65	98.5
	Sedentary	1	1.5
	<b>Total</b>	<b>66</b>	<b>100</b>

Table 4 presents the distribution of respondents in the normal weight category. 65 respondents (98.5%) were classified in the normal weight category with no sedentary physical activity and 1 respondent (1.5%) was classified in the normal weight category with sedentary activity.

**Table 5: Distribution of Overweight by Sedentary Physical Activity**

BMI	Sedentary Physical Activity	Number (n)	Percentage (%)
Overweight 23.0-24.9 kg/m <sup>2</sup>	Non-Sedentary	13	50
	Sedentary	13	50
	<b>Total</b>	<b>26</b>	<b>100</b>

Table 5 presents the distribution of respondents in the overweight category. 13 respondents (50%) were classified in the overweight category with no sedentary physical activity and 13 respondents (50%) were classified in the overweight category with sedentary activity.

**Table 6: Distribution of Obesity Class I by Sedentary Physical Activity**

BMI	Sedentary Physical Activity	Number (n)	Percentage (%)
Obesity class I > 25.0-29.9 kg/m <sup>2</sup>	Non-Sedentary	9	25
	Sedentary	27	75
	<b>Total</b>	<b>36</b>	<b>100</b>

Table 6 presents the distribution of respondents in the Obesity Class I category. 9 respondents (25%) were classified in the Obesity Class I category with no sedentary physical activity and 27 respondents (75%) were classified in the Obesity Class I category with sedentary activity.

**Table 7: Distribution of Obesity Class II by Sedentary Physical Activity**

BMI	Sedentary Physical Activity	Number (n)	Percentage (%)
Obesity class II ≥ 30 kg/m <sup>2</sup>	Non-Sedentary	7	24.1
	Sedentary	12	75.9
	<b>Total</b>	<b>19</b>	<b>100</b>

Table 6 presents the distribution of respondents in the Obesity Class I category. 7 respondents (24.1%) were classified in the Obesity Class II category with no sedentary physical activity and 12 respondents (75.9%) were classified in the Obesity Class II category with sedentary activity.

**Table 8: Results of Spearman Correlation Test Analysis between Sedentary Physical Activity and Body Mass Index**

Variable	Sig.	R-value
Body Mass Index and Sedentary Physical Activity	.000	.641

The results of statistical analysis using the Spearman correlation test showed a strong positive correlation ( $r=0.641$ ) which was significant ( $p=0.000$ ). Such findings indicated that the higher the sedentary physical activity, the higher the BMI, and vice versa.

## DISCUSSION

The results of the analysis found that most of the respondents had a normal BMI. Normal BMI was presumably due to preclinical students at the faculty of medicine having a high level of knowledge about BMI and complications of obesity, which is in line with the study conducted by Shahid et al. (2020).<sup>16</sup> Furthermore, the study finding is also in line with a study conducted by Rao et al. (2012) which revealed that most of the respondents had a normal BMI.<sup>17</sup> A study conducted by Arsh et al. (2017) found that most of the respondents had a normal BMI, followed by overweight, Obesity Class I, underweight, and Obesity Class II.<sup>19</sup> The result of this study is also in line with a study conducted by Jha et al. (2021) which found that the mean BMI of respondents was in the normal category.<sup>20</sup> In addition, a study conducted by Goharpei et al. (2014) further explained that most of the respondents had a normal BMI.<sup>21</sup> In contrast, a study conducted by Aslani et al. (2020) found that the mean BMI of respondents was in the overweight category.<sup>22</sup> A study conducted by Agrawal et al. (2016) also noted that the mean BMI of respondents was in the overweight category.<sup>23</sup>

Based on the study finding, it was found that there were more students in the non-sedentary category since most students in

the faculty of medicine had regular activities and those who had regular activities had more confidence in educating the public about appropriate physical activities, in accordance with the study conducted by Mandic et al. (2017).<sup>24</sup>

The results obtained in this study are supported by Yousif et al. (2019) in his study, which found that there were more respondents in the non-sedentary group.<sup>25</sup> In a study conducted by Goharpei et al. (2014), it was also revealed that most students did physical activity in the moderate category.<sup>21</sup> Furthermore, in a study conducted by Fernandez et al. (2014), it was found that more respondents did adequate physical activity.<sup>26</sup> In a study conducted by Bakr et al. (2002), it was also found that most of the respondents did adequate physical activity.<sup>27</sup> However, in a study conducted by Wattanapisit et al. (2016), it was revealed that more than half of students were in the sedentary category due to learning activities and work shifts beyond normal working hours.<sup>28</sup>

The results of analysis using the Spearman Correlation Test found that there was a significant relationship between sedentary physical activity and BMI based on the p-value of 0.00 ( $p < 0.05$ ). In this study, the correlation coefficient between the two variables was 0.641, which indicated that the two variables had a strong relationship. The higher the sedentary physical activity, the higher the BMI, and vice versa. Such a finding relates to the cumulative energy expenditure. Sedentary physical activity results in reduced cumulative energy expenditure from muscle contractions, which further leads to a positive energy balance and an increase in BMI.<sup>29</sup>

A study conducted by Ofori et al. (2019) revealed that there was a strong correlation between physical activity and BMI among university students in Ghana. The majority of students with obese BMI did more strenuous physical activity than other categories. Such a finding was probably due to obese students being more

motivated to lose weight compared to those in other BMI categories.<sup>30</sup> In contrast, a study conducted by Aslani et al. (2020) found that there was a weak significant relationship (correlation coefficient of -0.394) and reverse comparison between physical activity scores and BMI. In other words, when physical activity increases, BMI decreased.<sup>22</sup> A study conducted by Rao et al. (2012) obtained a finding that the higher the BMI, the higher the proportion of physical activity.<sup>17</sup> Furthermore, a study conducted by Goharpei et al. (2014) showed that there was no significant relationship between physical activity and BMI. Different findings were thought to be due to the type of questionnaire and assessment tools applied in the studies.<sup>21,31</sup>

## CONCLUSION

There was a significant positive relationship between sedentary physical activity and BMI, which indicated that the higher the sedentary physical activity, the higher the BMI. Such relationship suggested that sedentary physical activity had a positive role in the incidence of overweight and obesity.

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