



Original Article

Relationship between Physical Activity and Body Mass Index in Women's Volleyball Athletes during COVID-19 Pandemic in Special Region of Yogyakarta, Indonesia

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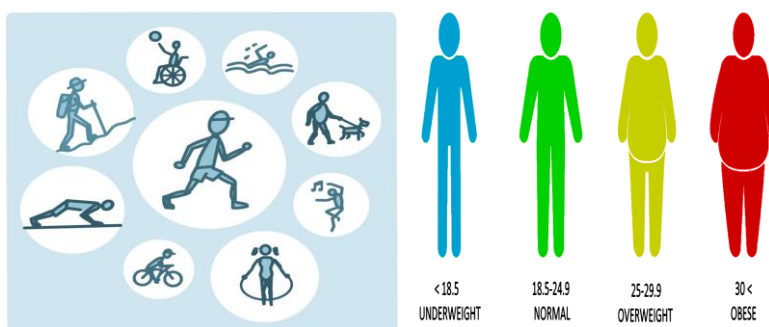
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ABSTRACT

The COVID-19 pandemic has made people experience lifestyle changes. The Indonesian government has implemented a policy of limiting activities to prevent the transmission of the Covid-19 virus. Physical activity will undoubtedly affect the physical condition of all people, including volleyball athletes. Decreased physical activity can increase body weight. The amount of physical activity and a person's body mass index (BMI) impact public health. Individuals who do much physical activity usually have a healthy BMI. Athletes who want to compete well must maintain a healthy level of physical activity and a healthy BMI. Accordingly, this study aimed to determine the relationship between the level of physical activity and BMI in female volleyball athletes in the Special Region of Yogyakarta. The research method relied on a cross-sectional study of 100 female volleyball athletes as members of an amateur club in the Province of the Special Region of Yogyakarta. Physical activity was assessed using the International Physical Activity Questionnaire after BMI was calculated and grouped according to World Health Organization (WHO) standards. Pearson correlation test was used to test the data. According to the findings of this study, the majority of athletes had a normal BMI and did the moderate physical activity. However, there was a significant relationship between physical activity and BMI in the study results, with a significance value of 0.000 and a Pearson correlation value of 0.799.

GRAPHICAL ABSTRACT



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Introduction

A volleyball athlete must follow a healthy diet to maintain physical fitness and daily BMI. Choosing the right food in the right portion is critical for maintaining health, physical fitness, and ideal body weight [1]. A good BMI and physical activity are also required for achieving a high level of physical fitness [2]. If given regular exercise, a person's BMI and physical activity improve, and their level of physical fitness improves [3].

Any bodily movement mediated by muscle work and energy expenditure is defined as physical activity [4]. Physical activity is highly significant, affecting the body's metabolism, psychological state, overall health, and quality of life [5]. Physical activity also has a beneficial effect on the immune system, lowering the risk of contracting infectious diseases like bacterial and viral infections. Several studies have shown that light physical activity is more common in obese adolescents than in non-obese adolescents. Light physical activity reduces energy output, resulting in an energy imbalance where energy input exceeds energy output. This increases the risk of overweight and degenerative diseases such as hypertension [3].

One of the factors linked to VO₂max is BMI. BMI is a simple way to track an adult's nutritional status, particularly when it comes to being underweight or overweight (obesity) [6]. According to the WHO, BMI is divided into five categories: bodyweight underweight with a BMI score of <18.5; a BMI of 18.5-22.9 indicating a healthy weight, with a BMI of 23-24.9 showing overweight. Obese bodyweight I is defined as a BMI of 25 to 29.9, and obese bodyweight II is defined as >30 [7, 8].

The Covid-19 pandemic has had various negative consequences on all corners [10]. The Covid-19 virus is also the cause of the highest death rate [9, 11]. Maintaining distance, also known as social distancing, limits selection to prevent the covid-19 virus from spreading [12]. The COVID-19 pandemic has also resulted in a decrease in community physical activity [13]. Moreover, some athlete centers have adopted this policy of separation. This may affect athletes' levels of physical activity. The COVID-19 pandemic has

involved nearly all athletes in a variety of sports. One of the consequences is the end of all sports competitions [14]. The cancellation of this competition will drastically reduce the amount of training time available to all competing athletes, including volleyball players. In addition, schools, universities, sports facilities, and fitness centers will be closed for the time being. These steps can limit athletes' ability to engage in physical activity [15]. Several studies have been conducted to determine the impact of the pandemic on the physical abilities of athletes, like the research conducted by Syamsuryadin on BMI with cardiovascular fitness in volleyball athletes during the covid-19 pandemic [8]. However, this research still has to be developed again to see female athletes' BMI with physical activity. As a result, this study aimed to investigate physical activity and BMI in female volleyball athletes from the Special Region of Yogyakarta during the COVID-19 pandemic.

Martials and Methods

This study relied on a cross-sectional design and was descriptive-analytic. 134 Female volleyball athletes who were members of amateur clubs in the Yogyakarta made up the research population. Calculation of sample size using the calculator.net sample calculation helper website showed the sample required for the use of this study was 100 players. The respondents ranged in age from 12 to 20 years old. Physical activity, the independent variable, and BMI, the dependent variable, are the two research variables. This research project was completed in December of 2021.

A long-form International Physical Activity Questionnaire (IPAQ) was used to assess physical activity, which was completed independently (self-administration) both online (Google form) and offline (questionnaire paper) [16]. The questionnaire contains 27 questions divided into several domains of physical activity, such as weekday physical activity, travel-related physical activity, neighborhood activities, and recreational physical activities. High Metabolic Equivalent of Task (MET) is defined as >3000 MET minutes per week, the medium is defined as >600 MET minutes per week, and low is defined as 600 MET minutes per week (Table 1) [17].

Table 1: Physical Activity Level

Category	Metabolic Equivalent of Task
Low	<600
Medium	600-3000
High	>3000

BMI is determined indirectly by asking for data on weight (BB) and height (TB) in the same questionnaire and then calculated using the

formula $BW(kg)/TB^2 (m^2)$, which is classified according to WHO (Table 2) [7].

Table 2: Body Mass Index (BMI) Category

Category	BMI
Underweight	<18.5
Normal	18.5-22.9
Overweight	23-24.9
Obesity I	25-29.9
Obesity II	>30

To analyze the research data, the Pearson correlation test was computed to see the relationship between physical activity and BMI. The data were statistically processed using the Statistical Product and Service Solution (SPSS) program.

Results and Discussion

Of the 100 female volleyball athletes, 24 respondents had an underweight BMI. There were 57 respondents with a normal BMI, 11

respondents with an overweight BMI, and 8 respondents with an obese BMI.

This study used a sample of female volleyball athletes who were members of amateur clubs in the Special Region of Yogyakarta, Indonesia. Descriptive statistical data from research on physical activity and BMI can be seen in the table below (Table 3).

Table 3: Characteristics of Body Mass Index

BMI	Frequency	%
Underweight	24	24%
Normal	57	57%
Overweight	11	11%
Obesity I	8	8%
Obesity II	0	0%
Total	100	100%

Of the 100 respondent's female volleyball athletes, 36 respondents had low levels of physical activity, 47 respondents with moderate

levels of physical activity, and 17 respondents with high levels of physical activity (Table 4).

Table 4: Physical Activity Level (of the 100 respondent's female volleyball athletes)

Category	Frequency	%
Low	36	36%
Medium	47	47%
High	17	17%
Total	100	100%

Of respondents who had an underweight BMI, there were 7 respondents with low levels of

physical activity, 10 respondents with moderate levels of physical activity, and 7 respondents with

high levels of fitness. Of respondents who had a normal BMI, there were 14 respondents with low levels of physical activity, 23 respondents with moderate levels of physical activity, and 20 respondents with high levels of physical activity (Table 5). Of respondents who had an overweight BMI, there were 8 respondents with low levels of

physical activity, 3 respondents with moderate levels of physical activity, and 2 respondents with high levels of physical activity. Of respondents who had a BMI of obesity 1, 4 respondents had a low level of physical activity, 2 respondents with a moderate level of physical activity, and none have a high level of physical activity.

Table 5: Physical Activity Level on BMI

BMI	Physical Activity Level			Total
	Low	Medium	High	
Underweight	7	10	7	24
Normal	14	23	20	57
Overweight	8	3	2	13
Obesity I	4	2	0	6
Obesity II	0	0	0	0
Total	33	38	29	100

The statistical tests using Pearson correlation obtained a significance value of 0.000 and a Pearson correlation value of 0.799, proving that

physical activity has a strong relationship with body mass index.

Table 6: Relationship between physical activity and BMI

Variable	Sig	Correlation
Physical Activity to BMI	0.000	0.799

Considering the COVID-19 pandemic, this study aimed to determine the relationship between physical activity and BMI of female volleyball athletes in the Special Region of Yogyakarta. According to the study's findings, there is a link between physical activity and BMI, as evidenced by the Pearson correlation value, which is 0.799. The test's significance was 0.000, which means $p < 0.0005$, and the correlation value is 0.799, indicating that the link is strong. According to these findings, the level of physical activity has a relationship with body mass index. Physical activity is one of the factors that can influence a person's BMI value. Still, there are many others, such as genetic factors, such as inherited factors from offspring with a history of obesity, and dietary consumption factors, such as nutritional intake. The aspect of resting patterns received by the body is adequate sleep to restore the body's condition. Age, gender, genetics, diet, and physical activity are all factors that can influence a person's BMI [18].

This study backs up research that shows physical activity is one factor that influences BMI [19]. As

stated earlier, this study used a different instrument from IPAQ. Athletes who do not engage in physical activity increase their activity or detox their health. The findings of study are supported by research that shows a link between obesity and physical activity. Physical activity helps weight gain or obesity, so it can be concluded that BMI and physical activity are linked [20]. This means that the higher a person's BMI, the more physical activity that person engages in. Low levels of physical activity can also significantly increase the prevalence of obesity. Obesity occurs when total energy expenditure, including energy for physical activity, exceeds total energy intake [21]. The following are some of the most common advantages of exercise:

1. Physical or biological profit: Keeping blood pressure in a stable and normal condition, increasing body resistance to avoid various diseases, maintaining normal and ideal body weight, strengthening bones and muscles, increasing body flexibility, and improving physical fitness [22].

2. Psychic/mental aspect: Reducing stress, increasing one's self-confidence, building sportsmanship in oneself, exercising one's responsibility, and building social loyalty.

As a result of the COVID-19 pandemic, many people have poor nutritional status and little physical activity. Continuing to do regular physical exercise can undoubtedly lower BMI to normal levels. It can also be used as stress suppression to reduce a person's stress, so exercising provides two benefits at once. Ideally, when you are stressed, you can control your diet to avoid overeating by engaging in physical activities or sports [23].

Conclusions

Data from research conducted on female volleyball athletes who joined amateur clubs in the province of the Special Region of Yogyakarta during the COVID-19 pandemic showed that the average athlete did physical activity in the moderate category. BMI shows the average results of female volleyball athletes are in the normal category. Based on the Pearson correlation data analysis, the significance value of $p = 0.000 < 0.05$, and the Pearson correlation value was 0.799. It can be concluded that there is a strong relationship between physical activity and BMI in female volleyball athletes in the Special Region of Yogyakarta during the COVID-19 pandemic. This study recommends that students to increase physical activity and exercise to maintain body condition at the ideal BMI level, and follow suitable diet arrangements.

Future research can examine the relationship between BMI with eating patterns, psychological conditions, and sleep patterns. In addition, analysis can also be carried out with different subjects, such as female soccer athletes or female basketball athletes.

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Authors' contributions

All authors contributed toward data analysis, drafting and revising the paper and agreed to responsible for all the aspects of this work.

Conflict of Interest

We have no conflicts of interest to disclose.

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