Original Article

Physical Activity and Body Mass Index Among Farmers: A Secondary Data Analysis of Non-Communicable Disease Program at Public Health Center of Jember, Indonesia

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Abstract

Background: The lack of physical activity and reduced time of working days among farmers impact their health problems, including increasing body mass index (BMI) and the risk for obesity among farmers.
Aim: This study was to analyze the correlation between physical activity and the level of BMI among farmers in Jenggawah Public Health Center of Jember
Material and Method: A retrospective cohort study was used to analyze the data of non-communicable disease program in 2020, among 81 of farmers, which used secondary data. The data collected includes, sociodemographics, physical activity, and BMI levels. A Chi-Square test was performed to analyze the data ($p<0.05$).
Results: The results indicated that farmers had physical activity > 150 minutes/week (90.1%) and abnormal BMI (53.1%). There was no significant relationship between physical activity and BMI levels ($p>0.05$). However, there was a significant difference between gender and BMI levels ($p= 0.012$)
Conclusion: There is no relationship between physical activity and BMI levels. Therefore, it is important to maintain physical activity and identify other factors that can affect BMI levels to prevent obesity among farmers

Key Words: non-communicable disease, body mass index, farmers, physical activity

Introduction

Non-communicable diseases (NCDs) have caused the death of almost 71% population of the world and have killed 36 million people (Kementerian Kesehatan RI, 2019a). The prevalence of NCDs such as diabetes, hypertension, stroke, and joint disease show an increase (Kementerian Kesehatan RI, 2019b). NCDs are prone to occur in at-risk populations such as farmers and, it can affect their productivity and long-term health (Susanto et al., 2017). One of the risk factors for NCDs is obesity (Kementerian Kesehatan RI, 2012). Obesity is the accumulation of excessive fat tissue which can be determined through the calculation of Body Mass Index (BMI), one of the indicators in determining

whether a person is obese or not (Christianto et al., 2018). Obesity or increased BMI can be influenced by several factors such as lack of physical activity due to lifestyle changes (Elder et al., 2016). Therefore, it is important to identify the relationship between physical activity and BMI levels among farmers at non-communicable disease program (Posbindu PTM) to prevent or lower the obesity cases as the triggering factor of NCDs in Indonesia.

The prevalence of obesity in Indonesia among productive age (> 18 years) revealed an escalation from 2013 (15.4%) to 2018 (21.8%) while the incident cases of obesity among farmers is 21.6%. Obesity occurs because of an increase in BMI indicated by BMI of ≥25 kg/m^2. The increased BMI can be influenced by several factors such as genetic, socioeconomic, demographic, lifestyle, and nutritional factors (Kementerian Kesehatan RI, 2013; Kementerian Kesehatan RI, 2018).

The lack of physical activity has an impact on obesity cases. Less physical activity among farmers are caused by the lack of working days as working less than 5 days per week has a risk of 16.67 times of being obese (Susanto et al., 2016). In addition, the vast advancement in technology lower the physical activities of farmers as they count on technology for agricultural activities which causes less caloric expenditure that elevate the obesity risk among farmers (Yanti et al., 2020). Another study revealed that from 2007 to 2015, the physical activity among farmers in China were decreased and caused significant increase in BMI, especially among female farmers (Wang et al., 2018). Farmers with obesity who are not treated immediately will have various metabolic and degenerative health problems such as cardiovascular disease, diabetes, cancer, osteoarthritis and etc (Kementerian Kesehatan RI, 2017).

The increasing number of NCD cases can be controlled by several strategies such as the implementation of Posbindu PTM government program spread over every village. The development of Posbindu PTM is an integral part of the health care system and includes various promotive and preventive efforts as well as referral patterns. The success of Posbindu PTM activities can be seen through health indicators as the variables to analyse and determine the health status (Kementerian RI, 2019).

The results of the secondary data study from the Posbindu PTM report at the Jenggawah Health Center during July–December 2019 revealed mixed results every month. There were 386 farmers of Posbindu PTM participated in this study and the findings indicated the number of obesity cases is 46.3%. The increase of obesity cases elevated every month, from July by 4.4%, August by 5.4%, September by 6.4%, and October by 11.9%. The causes of obesity which perceive as the risk factor for NCD such as the lack of physical activity should be identified. Therefore, it is important to conduct a study related to the relationship between physical activity and BMI among farmers at Posbindu PTM of Public Health Center of Jenggawah, Jember.

H_0: There is no relationship between physical activity and BMI levels

H_1: There are relationship between physical activity and BMI levels

Material and Method

A retrospective cohort study design was used to analyze the correlation between physical activity and BMI levels based on secondary data of Posbindu PTM Jenggawah Public Health Center, Jember Regency at 2020. The population in this research was taken from Posbindu PTM participants who registered in 2020. Data were screened based on inclusion and exclusion criteria, and the results were 81 samples. The inclusion criteria for this study were Posbindu PTM participants having data of physical activity and BMI levels. Meanwhile, the exclusion criteria were: 1) Posbindu PTM participants who were not farmers; 2) Participants who do not have data on physical activity and BMI levels for 3 months (September, October and November); 3) Participant who do not have data relate to age, age more than 59 years and below 15 years.

Data Collection Tools

Instruments: Health card (KMS) from Posbindu PTM was used to collect data of characteristics sample (age, gender, and education level), physical activity and BMI level. KMS classified the physical activity into 2 categories, which is < 150 minutes/week and > 150 minutes/week. BMI levels classified 3 categories by KMS, that is normal (BMI 18.5 – 22.9 kg/m^2), moderate (BMI 23 - 24 kg/m^2),

and bad (BMI ≥ 25 kg/m^2). This research merged the BMI level classification into 2 categories that excess BMI (≥ 23 kg/m^2) and normal BMI (≤ 22.9 kg/m^2).

Ethical Issues: The study was approved by the Ethical Committee Review Board of Indonesia of the Faculty of Dentistry, University of Jember No.978/UN25.8/KEPK/DL/2020. Then, we obtained ethical and administrative approval from the Faculty of Nursing, University of Jember, Department of Political Unity for the Protection of the Public, the District National Health Department, and Jenggawah Public Health Center. We interviewed and informed public health centers about the study. After permission was received, a data collection plan was designed. For incomplete data, the researchers asked the village cadres for help by looking at the cadres' records.

Statistical Analysis: All data were analyzed using the IBM Statistical Package for Social Sciences software program, version 24.0. Statistic descriptive was used to determine participants' characteristics, with mean and standard deviation (for numeric data) and percentage (for categorical data). Chi-Square test and T-test of independence were used to correlate the categorical and continuous variables, respectively. A *p*-value <0.05 was considered statistically significant.

Research Flow:

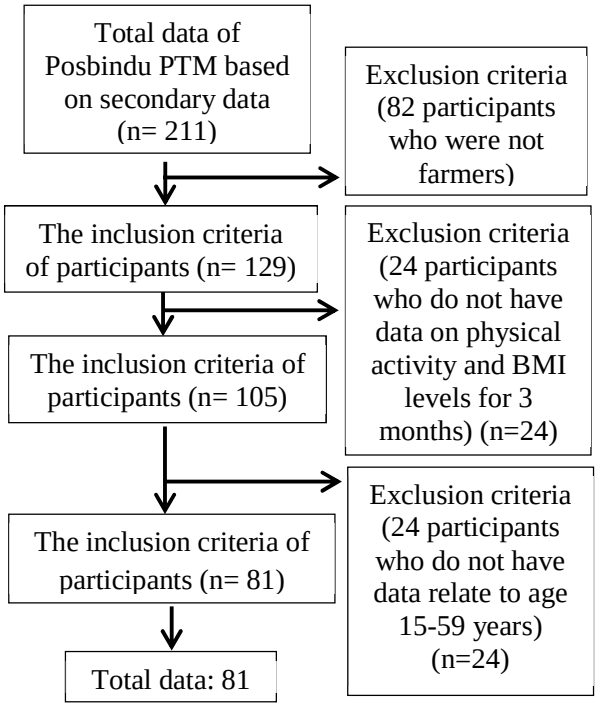

Figure 1. Sample Screening

Results

Characteristics of participants (Table 1) showed that the mean age of farmers participating in Posbindu PTM were 44.12 ± 9.339 years, with 79.0% of farmers of female and 21.0% of the male, respectively and majority 97.5% of the farmer have elementary school education. The measurement of physical activity among farmer was carried out by KMS from Posbindu PTM. Physical activity level fall into two categories, < 150 minutes/ week and > 150 minutes/ week, as presented on the following diagram (Figure 2). As shown in Figure 2, it reveals the level of physical activity of Posbindu PTM participants. It was found that

9.9% farmers had physical activity < 150 minutes/week and 90.1% farmers had physical activity > 150 minutes/week, so it can be concluded that the level of physical activity of farmers participating in Posbindu PTM of Jenggawah Health Center is quite good, because 90.1% of Posbindu PTM participants have physical activity > 150 minutes/week. Furthermore, from the physical activity data, the level of physical activity for each characteristic (Table 2).

Table 2 showed that physical activity among farmers are more physically active than > 150 minutes/ week (90.1%), with 18.5% of farmers of male and 71.6% of the female, respectively. Majority 87.7% was educated elementary school with physically active > 150 minutes/ week. The result of the *p*-value showed there were no significant correlation between physical activity and age (p = 0.843), and gender (p = 0.672), and education (p = 1.000). The measurement of obesity cases among farmers is defined through observing KMS of Posbindu PTM and calculating the BMI. The BMI levels are classified into normal (BMI 18.5 – 22.9 kg/m^2), pre-obese (BMI 23 - 24 kg/m^2), and obese (BMI ≥ 25 kg/m^2). The obesity cases are classified into slightly high BMI (≥ 23 kg/m^2) and moderate BMI (≤ 22.9 kg/m^2) as presented in the following diagram: (Figure 3).

As shown in Figure 3, it reveals that the BMI data of farmers participating in Posbindu PTM based on 2 categories showed that 53.1% farmers had excess BMI and 46.9% farmers had a normal BMI, so it can be concluded that the farmers participating in the Posbindu PTM Jenggawah Health Center were more likely to have excess BMI or obesity. Furthermore, from the BMI data, it can be seen based on the characteristics of farmers participating in Posbindu PTM to determine the BMI level for each characteristic (Table 3).

Table 3 showed that more farmers participating in Posbindu PTM have excess BMI or obesity (53.1%) than normal BMI (46.9%). Female showed that they had excess BMI (48.1%) than normal BMI (30.9%). Male showed the opposite result, namely those who had a normal BMI (16.0%) more than those with an excess BMI (4.9%). Based on the education level, 53.1% was educated elementary school with excess BMI (53.1%). The result of the *p*-value showed there was no significant correlation between BMI levels and age (p = 0.83), and education (p = 0.217). Meanwhile, there was significant correlation between BMI levels and gender (p = 0.012).

A Chi-Square test in 2x2 contingency tables was performed to analyze the relationship between physical activities level and BMI level among farmers. The results indicated that there is no relationship between physical activity and BMI level (p = 1.000) (Table 4).

Table 1. Characteristics of participant in Posbindu PTM (n = 81).

Variable		**n (%)**
Age (year)	Mean±SD	44.12±9.339
Gender	Male	17 (21.0)
	Female	64 (79.0)
Education	Not attending school	0 (0)
	Elementary school	79 (97.5)
	Junior high school	0 (0)
	Senior high school	2 (2.5)

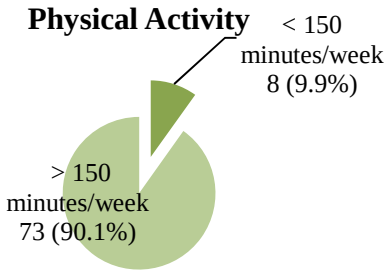

Figure 2. Distribution of physical activity levels.

Table 2. The level of physical activity based on the characteristics of age, gender, and education (n = 81).

	Physical Activity		*p-value*
	< 150 minutes/week	**> 150 minutes/week**	
Age			
Mean±SD	44.75±9.662	44.05±9.369	0.843[a]
Gender			
Male	2 (2.5)	15 (18.5)	0.672[b]
Female	6 (7.4)	58 (71.6)	
Education			
Not attending school	0 (0)	0 (0)	1.000[c]
Elementary school	8 (9.9)	71 (87.7)	
Junior high School	0 (0)	0 (0)	
senior high School	0 (0)	2 (2.5)	
Total	8 (9.9)	73 (90.1)	

p-value [(a)] = Independen T test, *p-value* [(b,c)] = Fisher's Exact test

Table 3. BMI level based on characteristics of age, gender, and education (n = 81)

	Body Mass Index (BMI)		*p-value*
	Excess BMI	**Normal BMI**	
Age			
Mean±SD	45.81±9.243	42.21±9.192	0.83[a]
Gender			
Male	4 (4.9)	13 (16.0)	0.012[b]
Female	39 (48.1)	25 (30.9)	
Education			
Not attending school	0 (0)	0 (0)	0.217[c]
Elementary school	43 (53.1)	36 (44.4)	
Junior high school	0 (0)	0 (0)	
Senior high school	0 (0)	2 (2.5)	
Total	43 (53.1)	38 (46.9)	

p-value [(a)] = Independent T Test, *p*-value [(b)] = Continuity Correction test, *p*-value [(c)] = Fisher's Exact test

Figure 3. BMI level distribution.

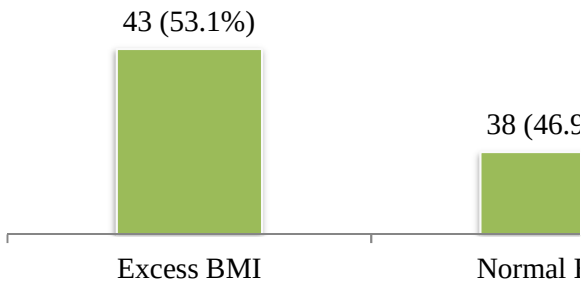

Table 4. The relationship between physical activity and BMI levels.

Physical Activity	Body Mass Index (BMI)				Total		RR (95% CI)	*p-value*
	Normal BMI		Excess BMI					
	Amount	(%)	Amount	(%)	Amount	(%)		
< 150 minutes/week	4	4.9	4	4.9	8	9.9	0.936 (0.453-1.933)	1.000
> 150 minutes/week	34	42.0	39	48.1	73	90.1		
Total	38	46.9	43	53.1	81	100		

Discussion

The study analyzed the relationship between physical activity and BMI lavel among farmers participating in Posbindu PTM. Regarding BMI levels, our findings identified that the prevalence of excessive BMI or obesity among farmers were 53.1%, these findings were higher compared to National Basic of Research of Indonesia in 2018 (21.6%) (Kementerian Kesehatan RI, 2018). This is probably due to the characteristics of farmer gender, which are in this study it shows that there was a significant relationship between gender and BMI level (p = 0.012) (Table 3), women showed more excessive BMI or obesity than men. In women there is fat accumulation during puberty, while in men muscle development occurs, this

causes fat in women to be twice as large as men (Nopembri, 2015), so women have a higher risk of obesity than men. Meanwhile, the prevalence of normal BMI among farmer were 46.9% which is lower compared National Basic of Research of Indonesia in 2018 (65.4%) (Kementerian Kesehatan RI, 2018). This is probably due to the farmer's diet, dietary regulation can maintain a normal BMI, namely by regulating incoming calorie intake such as fruit and vegetable consumption, and limit the consumption of foods low in sugar and saturated fat (Maier and Barry, 2014) ,so that it can reduce and prevent obesity or excessive BMI in farmers.

The study results also identified that the mean age of excess BMI among farmers were 45.81±9.243 years (Table 3), which are the age group of over 30 years are indicated having higher risk of obesity as getting older decrease the number of resting metabolic rates which causes muscle wasting and slower calories burning resulted in the accumulation of calories in the body which leads to obesity and over has a higher risk of obesity (Widiantini and Tafal, 2013). Theoretically, age can affect the level of BMI. However, the findings of the study posed no significant relationship (p = 0.83) (Table 3). Farmers with obesity who are not given immediate treatment could suffer various metabolic and degenerative health problems such as cardiovascular disease, diabetes, cancer, osteoarthritis and can also affect their productivity and long-term health (Susanto el al., 2016).

Furtermore, based on physical activity, we found that the prevalence physical activity > 150 minutes/week among farmer were 90.1%. These findings were revealed that most of the farmers had which correspond to the recommendation of Ministry of Health regarding the good physical activity for health is 150 minutes/ week (Kementerian Kesehatan RI, 2017). This is probably occurred because the agricultural activities require more active physical activity. Farmers have a higher physical activity level compared to other professions (Racine et al., 2012) and several farmers perceive that their exercise time is when they work (Nugroho et al., 2013). Excessive physical activity of farmers also needs to be considered regarding its impact on health as excessive physical activity related to working behavior factors will cause negative impact such as stress, malnutrition, joint and bone pain (Panjaitan et al., 2017). Meanwhile, the prevalence of physical activity > 150 minutes/week among farmer were 9.9% which is lower compared the previous study (72.9%) (Haruniati et al., 2019). This may be caused by the lack of working days as working less than 5 days per week has a risk of 16.67 times of being obese (Susanto et al., 2017). In addition, the vast advancement in technology lower the physical activities of farmers as they count on technology for agricultural activities which causes less caloric expenditure that elevate the obesity risk among farmers (Yanti et al., 2020). Therefore, having adequate physical activities will be significant to maintain health.

The study results also identified that the level of physical activity based on characteristic such as age, gender and education (Table 2). The mean age of physical activity > 150 minutes/ week among farmers were 44.05±9.369 years, which are the age group of 44-54 years is a productive age group that is active in farming (Panjaitan et al., 2017). However, the findings of the study posed no significant relationship (p = 0.843).

Furthermore, gender also revealed no significant relationship with physical activity (p = 0.672). Theoretically, male farmers perform more physical activity and longer working time compared to female farmers so that there is a possibility that duration of physical activity influence the physical activity level (Ratmayani et al., 2018) In addition, education level and physical activity among farmer showed no significant relationship (p = 1.000) which affirms the result of the previous study which stated that agricultural activities only require tenacity, skills and physical energy (Hugeng, 2011). However, farmers with higher education can be more aware of the benefits of doing physical activity (Cheah et al., 2017).

Our results identified that physical activity and BMI levels among farmers in Posbindu PTM at Jenggawah Health Center was no significant relationship (p = 1.000) (Table 4), which is consistent with a previous study (Christianto et al., 2018). These are indicates that physical activity is not the main factor causing excess BMI. Several factors can affect the level of BMI such as age, gender, social demographics, smoking habits, lifestyle and diet (Elder et al., 2016). However, based on the cases of 8 people who lack physical activity, 4 of them have excessive BMI or obesity. It reveals that lack of

physical activity can also be a risk factor for excess BMI or obesityas lack of physical activity affects the balance of incoming and outgoing energy which causes obesity (Christianto et al., 2018). This needs clinical consideration despite the results does not indicate a significant relationship, so that it can provide appropriate nursing interventions to the community. Other factors such as lifestyle and diet that were not examined in this study can also be one of the risk factors for obesity.

Based on the findings above, some limitations can be generated from this study. The first is employing retrospective study has a risk of inaccurate data within the current condition as the pandemic restrains the researcher to actively interact with community, so the secondary data were used instead. Secondly, the data were obtained from the health card of Posbindu PTM as the possibility of inaccurate calculation of BMI and physical activity level may occur because of its suitability with the standard of Posbindu PTM Implementation Guidelines cannot be guaranteed. The data of respondents were also too general, so the specific characteristics of the farmers from this study were also cannot be defined precisely.

Conclusion and Suggestion: Physical activity and BMI levels are not related that indicated physical activity performed daily in farming area. The increased BMI can be influenced by several factors such as genetic, socioeconomic, demographic, lifestyle, and nutritional factors. However, there is a significant difference between gender and BMI levels among farmers. Therefore, it is important to maintain physical activity and identify other factors that can affect BMI levels to prevent obesity among farmers. Further researchers in this case when using secondary data sources are expected when incomplete data is found, they can ask for help from related parties, such as health cadres. Further researchers are also advised to examine other natural factors that can affect BMI levels, such as eating habits and smoking behavior.

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