International Journal of PharmaO2
Journal Home Page: http://www.ijpo.in/
(IJPO: A Peer-reviewed Bi-monthly online journal)

Research Article

The Analysis of Risk Factors for Obesity in Academic Community of the University of Malahayati in 2020

Slamet Widodo[1*], Dessy Hermawan[2], Nurhalina Sari[3] and Muhammad[4]

[1]Bachelor of Medical Doctor, Faculty of Medicine, University of Malahayati, Pramuka Street No. 27 Kemiling Bandar Lampung, Indonesia +62721-271112.
[2]Bachelor of Nursing Study Program, Faculty of Medicine, University of Malahayati, Pramuka Street No. 27 Kemiling Bandar Lampung, Indonesia +62721-271112.
[3]Department of Public Health Promotion, Faculty of Public Health, University of Malahayatai, Pramuka Street No. 27 Kemiling Bandar Lampung, Indonesia +62721-271112.
[4]Bachelor of Economic Management, Faculty of Economy, University of Malahayati, Pramuka Street No. 27 Kemiling Bandar Lampung, Indonesia +62721-271112.

ARTICLE INFO

Article history:
Received: 15/02/2021;
Revised: 01/03/2021
Accepted: 03/03/2021;
Available online: 04/03/2021.

Key Words:
Obesity,
Risk factors,
Deficiency of vitamin D.

Please cite this article as: Widodo S. *et al.* (2021). The Analysis of Risk Factors for Obesity in Academic Community of the University of Malahayati in 2020. 3(2), 091-101.

ABSTRACT

The increasing of obesity prevalence in the age of 18 and above had increased significantly from year to year. This condition was a special challenge for public health workers, especially for the health promoters to see the impacts on health problems caused by obesity deeply. The incidence of obesity was often associated with several risk factors which cause the obesity. Some risk factors identified were the factors of vitamin D levels in blood, gender, heredity, socioe-conomic factors, exercise, food habit and sleep duration factor. This study aimed to determine the relationship between risk factors towards the incidence of obesity in academic community of the University of Malahayati Bandar Lampung in 2020. This research was a quantitative study. This study used an analytical observational with a case control research design. Data analysis used *chi square test*. On this study showed that the frequency of obesity in the group of respondents with hereditary factors who have an obese family history were 22 (73,3%), compared to respondents who did not have an obese family history were (23,3%). Statistical analysis found the frequency of obesity in heredity with category of obese family history was p_{-value} = 0,00 (p <0,05) OR = 9,036. Statistically, there was not relationship between the risk factors of vitamin D levels in blood, gender, socioe-conomic, exercise, food habit and sleep duration towards the incident of obesity. In this research, the risk factors for the deficiency of vitamin D did not have relationship with the incidence of obesity statistically; this study showed that 30 obese respondents who were assigned to the case group all of them had deficiency of vitamin D. Although, the fact that from 30 non-obese respondents, there were 29 respondents had deficiency of vitamin D too. Heredity with the category of obese family history had a significant relationship with the incidence of obesity in academic community of the University of Malahayati Bandar Lampung in 2020.

*Corresponding author: email- slametw@malahayati.ac.id

Introduction

Obesity or overweight is often defined as a disorder or disease characterized by excessive accumulation of body fat tissue (Sjarif *et al*., 2014). The increasing of Body Mass Index (BMI) can be a major risk factor for cardiovascular diseases such as heart disease, stroke, diabetes, osteoarthritis and cancer, including colorectal cancer, kidney cancer, ovarian cancer, breast cancer and prostate cancer (WHO, 2020), thus it could be understood that the high prevalence of obesity can have serious consequences for health conditions. BMI is a simple index of body weight for height which is commonly used to classify obesity in adults (Kementrian Kesehatan Republik Indonesia, 2014). In Indonesia, people can be said obese if they have BMI above 27 (Supriasa *et al*., 2014).

In various previous studies, obesity is often associated with the incidence of deficiency of vitamin D levels in the blood (25 OHD) in a person's body (Vanlint, 2013); (Hermawan, 2016**).** In theory, it is said that the increasing levels of vitamin D in the blood can reduce body fat by a long chemical process in a person's body. Vitamin D in reducing body fat is associated with decreased parathyroid hormone and increased blood calcium. Increased intake of vitamin D will cause a decrease in parathyroid hormone levels and an increase in calcium levels in the blood. Increased levels of calcium in the blood will increase sympathetic nerve activity so that it will be able to increase body heat production. This condition will cause an increase in the destruction of fat in the tissue (Soares *et al*., 2011). So in this study the authors believe that there is a relationship between risk factors for vitamin D deficiency and obesity. Obesity is closely related to deficiency of vitamin D levels in a person's body (Sundari, 2018).

On the other hand, the incidence of obesity in a person can be influenced by several other factors such as gender, socioeconomic factors, exercise habits, heredity, eating habits and sleep duration factors. Regarding the gender factor, it is said that the incidence of obesity in the elderly is related to diabetes mellitus, men are more exposed than women (Rita, 2018). Meanwhile, for socio-economic factors, it was found that good nutritional knowledge causes a person to have good eating habits, thus the possibility of consuming unhealthy foods also decreases. The lower the education, the higher the risk of obesity (Sugianti *et al*., 2014). The socioeconomic condition of a person contributes to the incidence of obesity, it is further revealed that the socio-economic condition has a significant effect related to the consumption of low-quality foods which will affect the increase in body mass index (Akil and Ahmad, 2011).

As for exercise habits, it can be explained that by providing physical exercise interventions and regular exercise for 6 to 12 months, it can lose 2-3% of one's body mass. In other studies, it was concluded that regular physical exercise can reduce body mass and lipid levels in the body (Kim et al., 2017). Then for heredity, the previous study was obtained that both parents and one of them who are obese have a tendency to give birth to obese children (Septiani and Raharjo, 2017). Furthermore, it is said that obese parents tend to have obese children too (Permatasari et al., 2013). And by using the latest genetic and physiological architectural models suggest the contribution of genes or heredity to a person's obesity condition (Walley *et al*., 2009). For the eating habits factor, it is explained that someone who is overweight or obese is a sign that food intake as a source of energy and the fat content exceeds the need (Par'i *et al*., 2017). Then for the duration of sleep, it was found that short or insufficient sleep duration could cause obesity (Pratiwi and Nindya, 2017). The optimal amount of sleep needed to adequately and to avoid sleep deprivation and not to have daytime sleepiness problems is around 7 - 8 hours for adults each day. This can avoid an increased risk of obesity, diabetes, or cardiovascular disease (Health, 2011).

Material and Method

This study was an *analytical observational* study with a *case control* study design. Data analysis used the chi-square test. This study aims to describe the relationship of risk factors such as blood vitamin D levels (25 OHD), gender, age, socioeconomic, exercise, physical activity, eating habits, sleep duration and genetic factors on

obesity that occurs in the the academic community of University of Malahayati Bandar Lampung in 2020. Respondents in this study were 60 lecturers, administrative staff and students. Of these 60 people were grouped into 30 respondents in the case group, namely respondents who were categorized as obese and 30 respondents who were categorized as control groups, namely respondents who were categorized as normal. Determination of obesity and normal is calculated using the BMI formula, namely body weight in kilograms divided by height in meters. After that the respondents were taken blood specimen samples to determine the vitamin D levels in the blood (serum 25 OHD) of all these respondents. Then the last respondent filled out a form to find out the description of the respondent related to gender, age, socioeconomic factors, exercise, physical activity, eating habits, sleep duration and genetic factors. After all the steps have been completed, statistical data will be carried out.

Result and Discussion

In data analysis, it is obtained an overview of the distribution of data and its relationship as follows. By univariate analysis, the frequency distribution of vitamin D in the case group obtained that there are 30 respondents (100%) have a deficiency of vitamin D, while from the control group it was found that there are 29 respondents (96.7%) also have a deficiency of vitamin D, only 1 respondent (3.3%) who is normal. The frequency distribution for gender found that there are 15 respondents (50%) from the case group are female and 15 respondents (50%) are male. Meanwhile, from the control group, 18 respondents (60%) are male and 12 respondents (40%) are male. For socio-economic variables, it is found that in the case group there are 26 respondents (86.7%) having a high socio-economic status and 4 respondents (13.3%) having a low socio-economic status. Meanwhile, in the control group, there are 28 respondents (93.3%) having a high socio-economic status and 2 respondents (6.7%) having a low sociao-economic status. Then for the exercise variable, the frequency distribution was found that in the case group there are 24 respondents (80%) doing exercise irregularly and 6 respondents (20%) doing exercise regularly. While in the control group, there are 25 respondents (83.3%) doing exercise irregularly and there are 25 respondents (16.7%) doing exercise regularly.

Then for hereditary factor, it is found in the case group, there are 22 respondents (73.3%) coming from families with a history of obesity and 8 respondents (27.6%) coming from families who don't have history with obese. Meanwhile, from the control group, there are 7 respondents (23.3%) coming from families with a history of obesity and 23 respondents (76.7%) are from families who don't have a history with obese. Furthermore, in the frequency distribution of food habits, in the case group there are 19 respondents (63.3%) having food habits with the high fat or carbohydrate and there are 11 respondents (36.7%) having balanced food habits. Meanwhile, in the control group, there are 22 respondents (73.3%) having food habits with the high fat or high carbohydrate and there are 8 respondents (26.7%) having balanced food habits. And the last variable, the frequency distribution of sleep duration in the case group, there are 24 respondents (80%) having sleep duration less than 8 hours each day and 6 respondents (20%) are adequate in sleep duration. Meanwhile, in the control group, there are 17 respondents (56.7%) having sleep duration less than 8 hours each day and there are 13 respondents (43.3%) having adequate sleep duration every day.

By observing the distribution of the data, the author used a chi-square test to perform the relationship between those variables and the incidence of obesity. From all variables are correlated with obese factors, it was found that there is only 1 variable having a significant relationship with the incidence of obesity. This variable is heredity. In this chi-square test was found that the $p\text{-}_{value}$ = 0.00 and OR = 9.036. It can be explained that there is a relationship between hereditary factors and the incidence of obesity. Furthermore, obtaining OR = 9.036 means that respondents who have hereditary factors with obese are at risk for obesity by 9.036 times compared to respondents who do not have hereditary factors with obese.

Although there is not significant relationship between the incidence of obesity and deficiency of vitamin D in the academic community of University of Malahayati, the distribution of data shows that there are 59 respondents (98.3%) from 60 respondents who were divided into two groups (case and control group) having a deficiency of vitamin D. It is really interesting enough to be investigated further. Although these results do not match what Simon Vanlint wrote in his journal review entitled Obesity and Vitamin D (Vanlint, 2013), but these results again and again will be a note that the deficiency vitamin D does not only occur on obese people, but can occur on not obese people. The deficiency of vitamin D occurs not only caused by obesity, but also triggered by other factors such as adequate sun exposure, food, disorders of the body's metabolic system, consumption of certain drugs and comorbidities (Hermawan, 2016). Moreover, it can be explained that the use of sunscreen and skin color also affects the occurrence of the deficiency of vitamin D (James Dowd and Stafford, 2012).

Table 1: Respondents Characteristics

No	Respondent Characteristics	Frequency (F)	Percentage (%)	Total (%)	
				F	(%)
	Body Mass Index (BMI)				
1	Non Obese	30	50	60	100
	Obese	30	50		
	Serum 25 OHD				
2	Normal	1	1,7	60	100
	Deficiency	59	98,3		
	Gender				
3	Male	27	45	60	100
	Female	33	55		
	Ages				
4	18 - 23 years old	51	85	60	100
	≥ 24 years old	9	15		
	Social-economy				
5	Low	6	10	60	100
	High	54	90		
	Exercise				
6	Regular	11	18,3	60	100
	Irregular	49	81,7		
	Physical Activity				
7	Our door	7	11,7	60	100
	In-door	53	88,3		
	Heredity				
8	Non obese	31	51,7	60	100
	Obese	29	48,3		
	Food Habits				
9	Balance	19	31,7	60	100
	High carbo or fat	41	68,3		
	Sleep Duration				
10	7 - 8 hours a day	19	31,7	60	100
	Less than 7 - 8 hours a day	41	68,3		

Table 2: Univariate Analysis Associated Factors with Obesity Incidence

Variabel	Categories	Case (Obese)		Control (Non Obese)	
		F	(%)	F	(%)
Serum 25 OHD	Normal	0	0	1	3,3
	Deficiency	30	100	29	96,7
Gender	Male	15	50	12	40
	Female	15	50	18	60
Ages	18 - 23 years old	26	86,7	25	83,3
	≥ 24 years old	4	13,3	5	16,7
Social-economy	Low	4	13,3	2	6,7
	High	26	86,7	28	93,3
Exercise	Regular	6	20	5	16,7
	Irregular	24	80	25	83,3
Physical Activity	Our door	4	13,3	3	10
	In-door	26	86,7	27	90
Heredity	Non obese	8	27,6	23	76,7
	Obese	22	73,3	7	23,3
Food Habits	Balance	11	36,7	8	26,7
	High carbo or fat	19	63,3	22	73,3
Sleep Duration	7 - 8 hours a day	6	20	13	43,3
	Less than 7 - 8 hours a day	24	80	17	56,7

Table 3: Chi Square Test Results of Associated Factors with Obesity Incidence

		The Incidence of Obesity				Sig	OR 95%
		Case		Control			
		N	%	N	%		
Serum 25 OHD	Normal	0	0	1	3,3	1,00	-
	Deficiency	30	100	29	96,7		
Gender	Male	15	50	12	40	0,60	0,667
	Female	15	50	18	60		
Ages	18 - 23 years old	26	86,7	25	83,3	1,00	0,769
	≥ 24 years old	4	13,3	5	16,7		
Social-economy	Low	4	13,3	2	6,7	0,67	0,464
	High	26	86,7	28	93,6		
Exercise	Regular	6	20	5	16,7	1,00	0,800
	Irregular	24	80	25	83,3		
Physical Activity	Our door	4	13,3	3	10	1,00	0,722
	In-door	26	86,7	27	90		
Heredity	Non obese	8	27,6	23	76,7	0,00	9,036
	Obese	22	73,3	7	23,3		
Food Habits	Balance	11	36,7	8	26,7	0,58	0,628
	High carbo or fat	19	63,3	22	73,3		
Sleep Duration	7 - 8 hours a day	6	20	13	43,3	0,10	3,590
	Less than 7 - 8 hours a day	24	80	17	56,7		

The data analysis use spss statistics 17.0. In the bivariate analysis using the *chi-square test* explained that there is not relationship between vitamin D levels in the blood (serum 25 OHD) and the incidence of obesity because the p-*value* was greater than 0.05. However, the distribution of respondents who have a deficiency of vitamin D is very big. There are 30 obese respondents in the case group (100%) having a deficiency of vitamin D and there are 29 non-obese respondents in the control group (96.7%) having a deficiency of vitamin D too. Regardless of the condition of the results of this study that most of the non-obese respondents in the control group having a deficiency of vitamin D, all of the obese respondents in the case group having a deficiency of vitamin D. This is separate evidence that although statistically there is no correlation, it is theoretically correct that vitamin D is closely related to the incidence of obesity.

The relationship between vitamin D and obesity can be explained that the increasing vitamin D in the blood will cause the decreasing parasympathetic hormone (PTH) and the increasing calcium levels in the blood. Along with the increasing calcium levels in the blood, will increase the sympathetic nervous system (SNS) response, thus it will affect the increasing body heat production (FOR and Thermogenis). With the increasing body heat production will cause the increasing of the destruction of fat (Do Novo Lipogenesis) in the body tissues. On the other hand, the increasing calcium levels in the blood will affect the entire work of the digestive tract so that it will cause a lot of fat to be wasted with feces (Faecal fat and Energy loss). Furthermore, it can be explained that the increasing vitamin D in the blood can stimulate or increase insulin production in the blood too. With the increasing hormone insulin can affect the sensitivity of the insulin hormone itself. Increasing sensitivity to the hormone insulin can reduce hunger. Finally, reducing hunger has an impact on reducing the amount of food intake.

In theory, from the whole series of processes that occur, it is true that increasing levels of vitamin D can reduce body fat (Soares et al., 2011). The same thing was also expressed by Ganji et al. that the increasing of the population of obesity in the data studied since 1988 to 1994 then continued again from 2001 to 2006 had an effect on decreasing vitamin status (Ganji *et al*., 2012).

Although in this study states that vitamin D does not have relationship to the incidence of obesity in the academic the community of University of Malahayati statistically, the occurrence of deficiency of vitamin D (serum 25 OHD) is very large, reaching 98.3% of the total respondents. This is the fact that again and again it suggests to all of us that Indonesians who receive daily exposure to sunlight as the main source of vitamin D still having a deficient of vitamin D. Other factors cause the deficiency of vitamin D may have an effect such as the use of sunscreen and the type of skin color also affect the occurrence of the deficiency of vitamin D (James Dowd and Stafford, 2012). Furthermore, a deficiency of vitamin D can occur due to wearing of long clothes, using umbrellas, riding covered vehicles, tending to be in the room during the day and other activities that block direct sunlight to the human frequently. (Hermawan, 2016). Moreover, it can be explained that the deficiency of vitamin D can caused by insufficient intake of foods containing provitamin D (Eliza Glowka *et al*., 2019).

Once again, related to the factors that cause the deficiency of vitamin D can be explained that medical conditions such as Crohn's disease, cystic fibrosis, celiac disease, removal of part of the intestine or stomach can be associated with malabsorption of fat which can lead to the deficiency of vitamin D. So that impaired absorption of fat can lead to the deficiency of vitamin D (Fiannisa *et al*., 2019).

Although the alternative hypothesis (Ha) is rejected and the null hypothesis (Ho) is accepted in this study related to the relationship of risk factors of vitamin D to the incidence of obesity, it can be underlines that the distribution of the deficiency of vitamin D in the incidence of obesity is very high. There are 30 obese respondents in the case group, all of them having a deficiency of vitamin D. Apart of the non-obese respondents in the control group, but they have a deficiency of vitamin D, it seems that the exposure to the cause of a deficiency of vitamin D is not only due to a single factor, that is

obesity only but other factors such as the adequacy factor in receiving sun light exposure, food intake, daily activity patterns, lifestyle, and certain diseases contribute to the deficiency of vitamin D.

Although the results of this study are actually not in line with previous research conducted by Simon Vanlint in 2013 entitled "Vitamin D and Obesity" with a total of 383 respondents, in which the study stated that the incidence of obesity can affect the occurrence of deficiency of vitamin D levels in the blood (25 OHD) with p-$_{value}$ = 0.014 (Vanlint, 2013), but a health promotion approach that emphasizes behavior change for healthy living is an alternative to controlling obesity and the deficiency of vitamin D.

The duration of sun exposure every day greatly affects the adequacy of vitamin D levels in the body. People who have outdoor activities every day have better levels of vitamin D in the body than people who have daily activities indoors. (Rimahardika *et al*., 2017). Based on this study, it was explained that people who work indoors are more at risk of having a deficiency of vitamin D than people who work outdoors, it can be caused by vitamin D intake obtained through sun exposure. Insufficient sun exposure due to frequent use of clothing covered with clothing that is difficult to absorb sunlight such as cotton cloth and body armor such as hats, umbrellas and sunscreens can also affect deficiency of vitamin D.

Regarding to the gender, from the *chi-square test* was found that p-$_{value}$ = 1,000 and OR = 1.667, meaning that there is not significant relationship between the gender with the female risk factor and the incidence of obesity in academic community of the university of Malahayati because the p-$_{value}$ > 0.05. In this case, Ha was rejected and Ho was accepted. This research is actually not in line with the previous studies conducted by Conklin et al. in 2016, the title "Minimum Wage and Overweight and Obesity in Adult Women: A Multilevel Analysis of Low and Middle Income Countries", where in the study it was found that the gender with the female risk factor has a relationship with the incidence of obesity with the p-$_{value}$ = 0.01 (Conklin *et al*., 2016). However, for the gender factor, could be female or male should pay more attention to this obesity problem, because it is known that the risk of obesity, both female and male can cause serious diseases such as heart disease, stroke, diabetes, osteoatritis and cancer. These include colorectal cancer, kidney cancer, ovarian cancer, breast cancer and prostate cancer (WHO, 2020).

By getting the p-$_{value}$ = 0.67 and OR = 0.464 through the chi-square test for socio-economic factor can be concluded that high socio-economic as the risk factors doesn't have relationship with the incidence of obesity. The alternative hypothesis (Ha) is rejected and the null hypothesis (Ho) is accepted. This research is actually not in line with the previous research conducted by Rifai Ali and Nuryani in 2018 entitled "Socio-Economic, Fast Food Consumption and Obesity History as A Risk Factors of Adolescent Obesity" The research stated that the high socio-economic as risk factor has relationship with the incidence of obesity with the p-$_{value}$ = 0,000. Nevertheless, socio-economic factors should be a driving force for better health conditions. Because someone who has a high socio-economic status will be easier to maintain his health, including the risk of obesity (Puluhulawa, 2013).

In the bivariate analysis using the *chi-square test*, it was found that the distribution of exercise factor there were 24 obese respondents (80.0%) did not do exercise regularly, and there were 25 non-obese respondents (83, 3%) didn't either. Then from the test obtained p-$_{value}$ = 1.00 and OR = 0.800. From the results of the *chi-square test* can be interpreted that there is not relationship between exercise and the incidence of obesity in academic community of the University of Malahayati in 2020. The result is the alternative hypothesis (Ha) is rejected and the null hypothesis (Ho) is accepted. It should be noted that this research can be interpreted as not in line with the previous research conducted by Muhammad Adam Mappaompo in 2010 with the theme "Obesity and Exercise" where in the study was stated that exercise was able to reduce the incidence of obesity (Mappaompo, 2010). And also it is not inherent with the previous research

conducted by Bo Yeon Kim et al. in 2017 too entitled "Obesity and Physical Activity" where in the study it was stated that physical activity or exercise has a significant value in losing weight with a p-$_{value}$ < 0.05 (Kim et al., 2017). Although the results of this study are not in line with the existing hypothesis, it is well known and realized by most of our society that exercise or physical activity has benefits for the health of the human body. Apart from the results of the statistical test analysis in this study which states that exercise doesn't have relationship with the incidence of obesity, it is has been recognized by everybody that having exercise regularly every day really helps to improve human health. Exercise or physical activity which is done regularly can reduce the risk of several chronic diseases and reduce premature death. Or in other words, it can be interpreted that lack of exercise or physical activity is the main cause of chronic disease. For this reason, exercise or physical activity is good and correct to improve health people both individual and groups in society (Brown *et al*., 2010).

Furthermore, it can be explained that exercise is very important for everybody in society. Exercise can increase human endurance. Exercise has been proven to be healthy for body and soul. Although it should be understood that exercise does not cause people to be immune to infectious diseases, by exercising regularly regularly can reduce the damage that may be caused by these infectious diseases (Giriwijoyo *et al*., 2005). Seeing the condition of Indonesia and all over the world nowadays, which is currently experiencing the pandemic Covid-19, diligently exercising will be able to increase endurance and minimize the impact caused by the infection of covid-19 virus.

Regarding the factors of food habits and sleep duration, the *chi-square test* did not find a significant relationship between them to the incidence of obesity in this study. Either the relationship between food habits and sleep duration on the incidence obesity has a p-$_{value}$ greater than 0.05; (p-$_{value}$ > 0.05). This illustrates that in this study, food habits with high carbohydrate or fat as the risk factor didn't have relationship with the incidence of obesity. Likewise, the sleep duration factor with sleeping less than 8 hours as a risk factor didn't have relationship with the incidence of obesity. In this study, it can be explained again that this study is not in line with the previous study written by Silveira et al. which stated that food habits with high carbohydrate or fat as the risk factor impacted to the incidence of obesity by obtaining p-$_{value}$ = 0.03 in the study (Silveira et al., 2016). And the sleep duration factor is also not in line with the previous researchers said, Damayanti et al. which stated that the sleep duration with the sleeping less than 8 hours as a risk factor has correlation with the incidence of obesity with the p-$_{value}$ = 0.001 (Rachmania Eka Damayanti et al., 2019). Although the food habits and sleep duration do not have a significant relationship with the incidence of obesity, specifically looking at the OR value on the sleep duration with sleeping less than 8 hours each a day as risk factor obtained the OR = 3.590 which is able to be interpreted that the respondent with sleeping less than 8 hours each a day has a risk 3.590 times to have an obesity.

Furthermore, although in this study the factors of food habits and sleep duration do not have relationship with the incidence of obesity statistically, it needs to be explained again that these two factors have a correlation with the degree of human health. Having good food habits and adequate sleep duration can improve human health. Related to food habits, consuming lots of fruits and vegetables every day can increase vitality and endurance. The more various types of food consumed, the more antioxidants and nutrients the body will produce. Natural antioxidants can be obtained from various types of vegetables and fruits such as broccoli, cabbage, green mustard greens, oranges and etc. In addition, vegetables and fruit also contain iron and vitamins which are very good for the body and there are many other ingredients in vegetables that are good for health. Therefore, vegetables and fruit are important for health. Moreover, if you do not eat enough vegetables can cause various conditions which disturb your health, such as anemia, vitamin deficiency and etc (Hargono, 2018).

Then also the duration of sleep has an important role in human health. Every individual should have adequate and quality sleep. Getting enough sleep at least 7 to 8 hours per day, and quality sleeping means sleeping without waking up in the middle of the night or having nightmares (Stevenson, 2014). More specifically, it is said that adequate in sleep duration can reduce the risk of developing high blood pressure or hypertension and heart disease (Alfi and Yuliwar, 2018).

Heredity is the only one variable in this study which has a significant relationship with the incidence of obesity. Based on the bivariate analysis, it was found that there are 22 respondents (73.3%) who have heredity with obesity. Meanwhile, there are 7 respondents (23.3%) who don't have heredity with obesity. The heredity with obesity comes from a father, a mother or both parents. Then by using the *chi-square test* obtained significantly the p-$_{value}$ = 0.00 and OR = 9.036.

From the results of the test, could be stated that there is a relationship between heredity and the incidence of obesity in the academic community of University of Malahayati because the p-$_{value}$ is <0.05. Related to the value of OR = 9,036, it means that respondents who have heredity with the obesity have a risk to be obese 9.036 times than respondents who don't have heredity with obesity. The alternative hypothesis (Ha) is accepted and the null hypothesis (Ho) is rejected. The results of this study is consistent with previous studies conducted by Apurva Srivastava et al. In 2016, the title "Genetics of Obesity", in which the study stated that heredity affects to the incidence of obesity (Srivastava et al., 2016). And this research is in line with earlier research conducted by Andrew J. Walley et al. entitled "The Genetic Contribution To Non-Syndromic Human Obesity" in 2009 which stated that the heredity (gene) of "suppressor of cytokine signaling" affects the incidence of obesity with p-$_{value}$ = 0.003 (Walley *et al*., 2009).

Conclusion

Although there is not relationship between vitamin D (serum 25 OHD) and the incidence of obesity in this study, from all the existing variables, both case and control groups, was found that 98.3% of the respondents having the deficiency of vitamin D. This will be a special note for researchers that deficiency can occur not only in obese but also in non-obese people. Related to other factors, the incidence of obesity is only significant with one factor that is heredity. Thus, in this study can be concluded that only heredity factors have a relationship with the incidence of obesity in the academic community of University of Malahayati Bandar Lampung in 2020 with a significant value of p-$_{value}$ = 0.00> (p-$_{value}$ <0.05) and odds ratio (OR). = 9,036.

Conflict of interest

The authors declare no conflict of interest.

References

1. Akil, L., and Ahmad, H. A. (2011). Effects of socioeconomic factors on obesity rates in four Southern States and Colorado. *Ethnicity and Disease*, 21(1), 58–62.

2. Alfi, W. N., and Yuliwar, R. (2018). The Relationship between Sleep Quality and Blood Pressure in Patients with Hypertension. *Jurnal Berkala Epidemiologi*, 6(1), 18. https://doi.org/10.20473/jbe.v6i12018.18-26

3. Brown, D. R., Health, G. W., and Martin, S. L. (2010). *Promoting Physical Activity* (2nd Editio). New Zealand: Human Kinetics P.O. Box 80.

4. Conklin, A. I., Ponce, N. A., Frank, J., Nandi, A., and Heymann, J. (2016). Minimum wage and overweight and obesity in adult women: A multilevel analysis of low and middle income countries. *PLoS ONE*, *11*(3), 14. https://doi.org/10.1371/journal.pone.0150736

5. Eliza Glowka, Stasiak, J., and Lulek, J. (2019). Drug Delivery Systems for Vitamin D Supplementation and Therapy. *MPDI*, *11*(2019), 21. www.mdpi.com/journal/pharmaceutics

6. Fiannisa, R., Kedokteran, F., and Lampung, U. (2019). *Vitamin D sebagai Pencegahan Penyakit Degeneratif hingga Keganasan : Tinjauan Pustaka Vitamin D as a Prevention of Degenerative to Malignancy Disease : Article Review*. *9*.

7. Ganji, V., Zhang, X., and Tangpricha, V.

(2012). Serum 25-Hydroxyvitamin D Concentrations and Prevalence Estimates of Hypovitaminosis D in the U.S. Population Based on Assay-Adjusted Data. *The Journal of Nutrition*, *142*(3), 498–507. https://doi.org/10.3945/jn.111.151977

8. Giriwijoyo, Y. S. S., Ichsan, M., Harsono, Setiawan, I., and Wiramihardja, K. K. (2005). *Manusia dan Olahraga* (Pertama, Vol. 1). ITB. https://doi.org/10.1017/CBO9781107415324.004

9. Hargono, R. (2018). *Hubungan Perilaku Hidup Sehat Dengan Status Kesehatan Relationship Between Healthy Behavior and Health Status in*. *6*(July 2018), 12–22.

10. Health, N. I. of. (2011). Your Guide to Healthy Sleep. In *US Department of Health and Human Services. National Institutes of Health, National Heart, Lung and Blood Institute. November 2011. NIH Publication No. 06* (Revisi, Vol. 5271). www.nhlbi.nih.gov/sleep%0ANHLBI

11. Hermawan, D. (2016). *Sehat Selalu Dengan Vitamin D* (A. Pramesta (ed.); 1st ed.). CV. Andi Offset.

12. James Dowd, M. D., and Stafford, D. (2012). *The Vitamin D Cure* (Revised).

13. Kementrian Kesehatan Republik Indonesia. (2014). *Epidemi Obesitas* (1).

14. Kim, B. Y., Choi, D. H., Jung, C. H., Kang, S. K., Mok, J. O., and Kim, C. H. (2017). Obesity and physical activity. *Journal of Obesity and Metabolic Syndrome - JOMES*, *26*, 8.

15. Mappaompo, M. A. (2010). Obesitas Dan Olahraga. *Jurnal Ilara*, *Volume I*(Desember 2010), 7.

16. Par'i, H. M., Wiyono, S., and Harjatmo, T. P. (2017). *Penilaian Status Gizi* (Widyasari, D. A. Nofaldo, and Sapriyadi (eds.); Pertama). Pusat Pendidikan Sumber Daya Manusia Kesehatan Badan Pengembangan dan Pemberdayaan Sumber Daya Manusia Kesehatan Kementrian Kesehatan Republik Indonesia.

17. Permatasari, I. R. I., Mayulu, N., and Hamel, R. (2013). Analisa Riwayat Orang Tua Sebagai Faktor Resiko Obesitas Pada Anak Sd Di Kota Manado. *Jurnal Keperawatan*, *1*(1), 7.

18. Pratiwi, A. A., and Nindya, T. S. (2017). Hubungan Konsumsi Camilan dan Durasi Waktu Tidur dengan Obesitas di Permukiman Padat Kelurahan Simolawang, Surabaya Relation between Snacking and Sleep Duration with Obesity at Slum Area Simolawang Sub-District, Surabaya. *AzizaH Ajeng Pratiwi Dan Triska Susila Nindya*, 153–161. https://doi.org/10.20473/amnt.v1.i3.2017.153-161

19. Puluhulawa, I. (2013). Pengaruh Faktor Sosial Ekonomi Terhadap Status Kesehatan Masyarakat Di Kecamatan Palu Selatan. *E-Journal*, *1*(3), 10.

20. Rachmania Eka Damayanti, Sri Sumarmi, and Luki Mundiastuti. (2019). Hubungan Durasi Tidur dengan Kejadian Overweight dan Obesitas pada Tenaga Kependidikan di Lingkungan Kampus C Universitas Airlangga . *Amerta Nutrition*, *3*(2), 89–93. https://doi.org/10.2473/amnt.v3i2.2019.89-93

21. Rimahardika, R., Subagio, H. W., and Wijayanti, H. S. (2017). Asupan Vitamin D dan Paparan Sinar Matahari Pada Orang Yang Bekerja Di Dalam Ruangan dan Di Luar Ruangan. *Journal of Nutrition College*, *6*(2017), 10. https://doi.org/10.1038/184156a0

22. Rita, N. (2018). Hubungan Jenis Kelamin, Olah Raga Dan Obesitas Dengan Kejadian Diabetes Mellitus Pada Lansia. *Jik- Jurnal Ilmu Kesehatan*, *2*(1), 93–100. https://doi.org/10.33757/jik.v2i1.52

23. Septiani, R., and Raharjo, B. B. (2017). Pola Konsumsi Fast Food, Aktivitas Fisik dan Faktor Keturunan Terhadap Kejadian Obesitas (Studi Kasus pada Siswa SD Negeri 01 Tonjong Kecamatan Tonjong Kebupaten Brebes). *Public Health Perspective Journal*, *2*(3), 262–269. http://journal.unnes.ac.id/sju/index.php/phpj

24. Silveira, E. A. Da, Vieira, L. L., Jardim, T. V., and Souza, J. D. De. (2016). Obesity and its association with food consumption, diabetes mellitus, and acute myocardial infarction in the elderly. *Sociedade Brasileira De Cardiologia SBC*, *107*(6), 9. https://doi.org/10.5935/abc.20160182

25. Sjarif, D. R., Gultom, L. C., Hendarto, A., Lestari, E. D., Sidiartha, I. gusti L., and Mexitalia, M. (2014). Diagnosis, Tata Laksana dan Pencegahan Obesitas pada Anak dan Remaja. *Ikatan Dokter Anak Indonesia*, 1.

26. Soares, M. J., Chan She Ping-Delfos, W., and

Ghanbari, M. H. (2011). Calcium and vitamin D for obesity: A review of randomized controlled trials. *European Journal of Clinical Nutrition*, *65*(9), 994–1004. https://doi.org/10.1038/ejcn.2011.106

27. Srivastava, A., Srivastava, N., and Mittal, B. (2016). Genetics of Obesity. *Indian Journal of Clinical Biochemistry*, *31*(4), 11. https://doi.org/10.1007/s12291-015-0541-x

28. Stevenson, S. (2014). *Sleep Smarter* (1st Editio). The Model Health Show. www.TheShawnStevensonModel.com

29. Sugianti, E., . H., and Afriansyah, N. (2014). Faktor risiko obesitas sentral pada orang dewasa di dki jakarta: Analisis Lanjut Data riskesdas 2007. *Gizi Indonesia*, *32*(2), 105–116. https://doi.org/10.36457/gizindo.v32i2.73

30. Sundari, L. P. R. (2018). Defisiensi Vitamin D Pada Obesitas. *Sport and Fitness Journal*, *6*(1), 1–5. https://doi.org/10.24843/spj.2018.v06.i01.p01

31. Supriasa, I. D. N., Bakri, B., and Fajar, I. (2014). *PENILAIAN STATUS GIZI* (E. Rezkina and C. A. Agustin (eds.); 2nd ed.). Penerbit Buku Kedokteran EGC.

32. Surahman, and Supardi, S. (2016). *Ilmu Kesehatan Masyaraakt - PKM* (Abzeni, Sunarty, and Sapriyadi (eds.); Pertama). Pusdik SDM Kesehatan - Bidang Pengembangan dan Pemberdayaan Sumber Daya Manusia Kesehatan - Kementrian Kesehatan Republik Indonesia.

33. Vanlint, S. (2013). Vitamin D and Obesity. *Nutrients*, *5*, 8. https://doi.org/10.3390/nu5030949

34. Walley, A. J., Asher, J. E., and Froguel, P. (2009). The Genetic Contribution to Non-Syndromic Human Obesity. *Nature Reviews Genetics*, *10*(7), 13. https://doi.org/10.1038/nrg2594

35. WHO. (2020). *Obesity*. WHO. https://www.who.int/news-room/facts-in-pictures/detail/6-facts-on-obesity.