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Physical Activity and Vitamin D Level in Asthma and Non-Asthma

Amelia Lorensia[1], Rivan Virlando Suryadinata[2], Rifaldi Saputra[1]

ABSTRAK : *Worsen asthma symptoms is associated with low vitamin D levels that increases asthma attacks risk. Physical activity is one factor that affects vitamin D levels in the blood. This study aimed to identify relationship physical activities effects with vitamin d levels on asthma and non-asthma patients. The study was conducted in March-June 2018. The subjects were asthma patients and non-asthma adults and didn't have other comorbidities. Data analysis used pearson test to determine physical activity effect with vitamin D levels. There were significant differences in vitamin D levels (P <0.000) and physical activity (P <0.000) in asthma and non asthma respondents. The results of the correlation test between vitamin D levels and physical activity in Approximate Significance value was 0.965, which means there were very strong relationships between vitamin levels and physical activity on the respondents of asthma and non asthma. So, the asthma patients with sufficient physical activity will have normal vitamin D levels to improve control of asthma symptoms.*

Keywords: *asthma, vitamin D levels, physical activity*

ABSTRAK: Memburuknya gejala asma dikaitkan dengan kadar vitamin D rendah yang meningkatkan risiko serangan asma. Aktivitas fisik adalah salah satu faktor yang mempengaruhi kadar vitamin D dalam darah. Penelitian ini bertujuan untuk mengidentifikasi hubungan efek aktivitas fisik dengan kadar vitamin D pada pasien asma dan non-asma. Penelitian ini dilakukan pada bulan Maret-Juni 2018. Subjek penelitian adalah pasien asma dan non-asma dewasa dan tidak memiliki komorbiditas lain. Analisis data menggunakan uji pearson untuk mengetahui efek aktivitas fisik dengan kadar vitamin D. Ada perbedaan yang signifikan dalam kadar vitamin D (p <0,000) dan aktivitas fisik (P<0,000) pada responden asma dan non asma. Hasil uji korelasi antara kadar vitamin D dan aktivitas fisik pada nilai Approximate Significance adalah 0,965, yang berarti ada hubungan sangat kuat antara kadar vitamin D dan aktivitas fisik pada responden asma dan non asma. Dengan demikian, pasien asma dengan aktivitas fisik yang cukup akan memiliki kadar vitamin D normal untuk meningkatkan kontrol gejala asma.

Kata kunci: asma, kadar vitamin D, aktivitas fisik

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INTRODUCTION

MeAsthma is a respiratory disease that is worse than 235 million people in the world and is a common disease in children (1). The prevalence of asthma in East Java province was 5.1%, slightly higher than the national scale of 4.5% (2). Asthma symptoms appear cause hyperresponsive in respiratory tract, especially at night or early morning. Clinical symptoms that occur can include wheezing, shortness of breath, chest feeling heavy, coughing, varying degrees and spontaneously reversible. Symptoms of asthma that occur can affect many factors, such as causing an increase in medical costs, the increased chance of an attack/ exacerbation of asthma, and even death (3).

Worsening asthma symptoms with low levels of vitamin D in the body which increases the risk of asthma attacks. The frequency of deficiency and vitamin D deficiency in asthma patients is higher than non-asthma (4,5). Vitamin D is a fat-soluble vitamin and has anti-inflammatory and immune-modulating effects (6). Vitamin D can from vitamin D supplements and sun exposure. Vitamin D which enters the body, will be converted to 25 (OH) D in liver, then to 1.25 (OH) D in kidney which is then circulated throughout the body. Normal level of vitamin D is measured through 25 (OH) D in blood, is normal (suficiency) if the range is 34-90 ng/mL (7).

Vitamin D can be increased by using vitamin D supplements and also do enough physical activity. Having sufficient vitamin D levels can reduce the risk of severe asthma exacerbations, and can also prevent the risk of hospitalization due to an asthma attack (8). Physical activity is one of the factors that influence vitamin D levels in the blood. Individual characteristics, social environment, and physical environment influence different levels of physical activity per individual (9,10).

The thinking that has been mistaken for asthma patients who have the view that physical activity can worsen asthma symptoms, the risk of the disease in a long time. Patients with serious illnesses have confidence that physical activity is not good for asthma (11). The unwillingness to do physical activity is not only due to worsening of asthma symptoms, but also due to psychological factors (12,13). Exercise-induced asthma is a symptom of asthma that arises in non-asthma patients due to excessive physical activity. This can happen when someone is doing heavy physical activity, so it needs to breathe more, faster by mouth. This then causes the air entering the lungs to be cooler and drier than normal air. Bronchial membranes in the lungs can swell, which then causes the appearance of asthma symptoms such as wheezing. Exercise-induced asthma generally occurs in winter (14,15). It is very difficult to do vigorous physical activity which can lead to exacerbations in uncontrolled asthma patients. Some asthma patients can experience exacerbations when performing certain physical activities. This can be prevented if you have controlled asthma, and also understand the symptoms of an asthma exacerbation, easily get asthma medication, and perform physical activities that are compatible with the asthma that you have (16).

When an asthma patient can control the symptoms of asthma, doing appropriate physical activity can prevent the occurrence of an asthma exacerbation later on. Doing physical activities like jogging, playing soccer, and playing basketball can improve worsening of asthma symptoms. Adjustment to physical activity needs to be done in patients who have just been exposed to an asthma exacerbation (17). Physical activity carried out by asthma patients is important to improve the quality of life of asthma patients (11,16). The information related to the influence of the relationship of physical activity and vitamin D is expected to be an input for health workers to improve a healthy lifestyle for asthma patients. Not only in the pharmacological treatment, non-pharmacological treatment supports the improvement of the quality of life of asthma patients (3). Therefore, the aim of this study was to determine the effect of physical activity on vitamin D levels in asthma and non-asthma patients.

METHOD

Research Design

The research method used in this study was observational with observations of vitamin D levels and physical activity. This study used a cross sectional design with 2 groups, namely the asthma group and the non-asthma group. From each group, it would then be grouped based on vitamin D levels, and physical activity measurements are taken. The study was conducted in the city of Surabaya, namely at a private university in Surabaya.

Research variable

The independent variable of this study was vitamin D levels and physical activity, while the dependent variable of this study was asthma and non asthma patients. Physical activity was any body movement produced by skeletal muscles which requires energy to move. Physical activity was measured using a modified questionnaire from the International Physical Activity Questionnaire (IPAQ) (18). Subjects would be interviewed to see physical activity carried out during the past week, and would be grouped into 3 groups, namely Mild Physical Activity (<600 MET-minutes / week), Moderate Physical Activity (600-1500 MET-minutes / week), and Vigorous Physical Activity (> 1500 MET-minutes / week). Vitamin D levels in the blood are levels of calcidiol [25 (OH) D] in the blood. Measurement of vitamin D levels in the body using a 25-hydroxyvitamin D [25 (OH) D] blood test. Vitamin D levels obtained would be grouped into 3 groups, namely normal (34-90 ng / mL), lacking (20-33 ng / mL), and deficiency (<20 ng / mL).

Research Population and Subject

Population were subjects with a history of asthma and non asthma, with inclusion criteria: >18 years old, using a motorcycle when traveling, using a jacket and helmet in driving, and willing to take voluntary research after receiving informed consent. The exclusion criteria in this study, namely: have other lung diseases such as COPD (Chronic Obstructive Pulmonary Disease) and tuberculosis, smokers because it can reduce the metabolism of vitamin D in the body due to the many harmful components that are in the body, so the vitamin levels D decreases (19), and using glucocorticoid drugs in the past week, because the use of this class of drugs can cause a decrease in vitamin D levels in the body (20).

The sample size used in this study uses the equation of the Fisher's formula (1998): n = Z2.P.Q/ d2, with n: number of samples; Z: normal standard deviation, whose value depends on the P value which can be seen in the distribution table (1.96); P: proportion to certain traits estimated to occur in the population (in East Java); Q: 1.0 - P (Q is the proportion of properties that is not expected to occur in the population) = 1-0.017 = 0.983; d: degree of deviation = 0.05. So, the sample size of the (n) minimum in each group is 25.67 ~ 26 people.

Work procedures

a. Validate Physical Activity Questionnaire. Questionnaire validation was conducted to see whether the questionnaire used was valid and reliable. Validation of the questionnaire will be done with 2 validations, namely content and construct validation. IPAQ modification is carried out in accordance with activities that are often carried out by the community.
b. Subject Collection. Collection of research subjects, researchers will use purposive sampling method. Researchers will search for research subjects that match the inclusion and exclusion criteria. Subjects who were willing to be the subject of the study contacted the researcher to make an appointment related to subject data collection.
c. Measurement of Physical Activity. Subjects will be interviewed for one measurement to find out the physical activity carried out by the subject for a week.
d. Measurement of 25 (OH) levels of Vitamin D. Measurement of 25 (OH) D levels using an enzyme-linked immunosorbent assay (ELISA) Human Vitamin D examination method. Measurements were made by taking

venous blood in the ± 3 mL elbow fold by health personnel using a syringe, in the area to be taken with antiseptic blood, the elastic band (torniquet) was placed around the upper arm to put pressure to clarify venous blood vessels. After taking blood, the blood sample is placed in a vacutainer tube, then centrifuged to obtain blood serum. Blood serum is placed in the eppendorf tube, then taken to the Biochemistry Laboratory of Airlangga University, Surabaya to analyze vitamin D levels.

Data analysis

Data analysis to determine the effect of physical activity with vitamin D levels using Pearson test analysis.

RESULT AND DISCUSSION

The study was conducted in March-June 2018. Subjects involved in the study were 52 people, consisting of 26 people with asthma and 26 people without asthma. In this study, no subjects were dropped out.

Subject Characteristics

Characteristics of the study sample were grouped by age, sex, and history of asthma treatment. The sex of the subject is known based on the subject demographic data and the gender category is distinguished by male and female. Subjects of asthma were female (73.08%) and male (26.92%). Non-asthma subjects were female (80.77%) and male (19.23%) (Table 1). The age of the subject was known based on the subject's demographic data and at the time of the interview. All subjects, both those with asthma and non-asthma subjects who participated in this study were active students and were late adolescents, namely 17-25 years. The most asthma subjects aged 20-22 years (56.69%) and there were 26.92% of asthma subjects who were aged 17-19 years and there were 15.38% of asthma subjects aged 23-25 years. Most non-asthma subjects were aged 20 years to 22 years (53.84%) and there were 38.47% of asthma subjects who were aged 23 years to 25 years and there were 7.69% of asthma subjects aged 17 years to 19 years.

Based on the results of the study showed that information about the history of asthma treatment obtained only through interviews with each subject and demographic data, in Table 1 it can be seen that asthma subjects who used inhaled short-acting β-2 agonists were 73.08% and asthma subjects (26.92 %) who use short-acting β-2 oral agonists.

From Table 1, it can be seen that the results of P-test on sex between subjects of asthma and non-asthma were 0.740. This value is smaller than the threshold value of P (P value> α value) so it can be

Table 1. Characteristics of research subjects

Characteristics		Groups				Intergroup Difference Test	
		Asthma (n:26)		Non-asthma (n:26)		P value	Conclusion
Gender	Man	7	(26.92%)	4	(15.38%)	0.740	no significant differences
	Woman	19	(73.08%)	22	(84.62%)		
Age (year)	17-19	7	(26.92%)	2	(7.69%)	0.103	no significant differences
	20-22	15	(56.69%)	14	(53.84%)		
	23-25	4	(15.38%)	10	(38.47%)		
History of Asthma Treatment	Short-acting oral β-2 agonist	7	(26.92%)				
	Short-acting β-2 agonist inhalation	19	(73.08%)				

concluded that there is no significant difference between the two groups. Test of P value for age between acid and non-asthma subjects was 0.103. This value is also smaller than the alpha value (P value> α value) so it can be concluded that there is no significant difference between the two groups related to age.

Blood Vitamin D Levels in Asthma and Non-Asthma Subjects

Categories of vitamin D levels can be divided into 3, namely deficiency if vitamin D levels <20 ng / mL (<50 nmol/L); insufficiency if vitamin D levels are 20-32 ng / mL (50-80 nmol/L); and normal if the vitamin D level is 54-90 ng / mL (135-225 nmol/L) (7). The results of measurements of vitamin D levels showed that there were no asthma subjects who had vitamin D levels in the normal category. There were 24 people with asthma who experienced vitamin D insufficiency (92.31%) and 2 (7.69%) of them experienced vitamin D deficiency. Non asthma subjects who had vitamin D insufficiency there were 15 people (57.70%) and 11 people (42.30%) had deficiency. vitamin D. Subjects of asthma (92.31%) had insignificant levels of vitamin D which had an average vitamin D level of 24.91 ng/mL, while non-asthma subjects (57.70%) had vitamin D levels classified as deficient with vitamin D levels. an average of 21.99 ng / mL. The homogeneity test results between the two groups have a P value (0.223)>α(0.05), so it can be concluded that the data has the same variant. The test results of differences between asthma subjects and non-asthma subjects related to vitamin D levels have P (0.000) <α (0.05) and it can be concluded that there are significant differences in vitamin D levels between asthma and non-asthma subjects.

Physical Activity in Asthma and Non-Asthma Subjects

The IPAQ (International Physical Activity Questionnaire) questionnaire used in this study has been translated, and then the construct has been validated by 3 experts. Questionnaires that have been validated, questionnaires were tested on 20 subjects with characteristics and were in the same area as planned research sites. The results of the questionnaire trial, most subjects experienced difficulties related to moderate physical activity or heavy physical activity. To overcome the possibility of biased data, a questionnaire was modified by collecting data on physical activity classified as mild, moderate and severe. This distinguishes the questionnaire used where the subject does not need to determine the level of physical activity they are doing (mild, moderate, or severe physical activity), but only explains the type and frequency of physical activity carried out. Modification questionnaire containing various validated physical activities of 20 other subjects to find out if there is physical activity outside of the given list and then made into one same physical activity questionnaire. Subjects who were given this modification questionnaire were more understanding about the physical activity questionnaire.

The physical activity questionnaire consists of 7 questions that ask about mild, moderate physical activity, weight how long it takes to walk, and sit. Subjects were interviewed and then results were obtained that categorized subjects into mild, moderate, or severe physical activity. In the asthma group there were 20 people doing high physical activity (76.92%), as many as 5 people doing moderate physical activity (19.24%), and as many as 1 person doing low physical activity (3.84%). In the non-asthma group as many as 13 people were doing moderate physical activity (50%), as many as 11 people doing high physical activity (42.31%), and as many as 2 people doing low physical activity (7.69%). P value (0.014) <α(0.05), so it can be concluded that there were significant differences (Table 2).

The division of physical activity was divided into 3 groups. ie low group (<600 MET-minutes/ week), moderate group (600-1500 MET-minutes/ week), and high group (>1500 MET-minutes/ week). Based on Table 2, asthma subjects as many as 20 subjects (76.92%) performed high physical

Table 2. Distribution of Frequency of Physical Activity in Asthma and Non-Asthma Subjects

Physical Activity		Groups				P value	Conclusion
		Asthma (n:26)		Asthma (n:26)			
Category	Mild	1	(3.84%)	2	(7.69%)	0.014	There was significant differences

Table 3. Correlation Tests between Physical Activity and Vitamin D Levels

Correlations			
		Nilai	Aktv
Vitamin D Levels	Pearson Correlation	1	.965**
	Sig. (2-tailed)		.000
	N	52	52
Physical Activity	Pearson Correlation	.965**	1
	Sig. (2-tailed)	.000	
	N	52	52

**. Correlation is significant at the 0.01 level (2-tailed).

activity compared to non-asthma subjects (42.31%). Non-asthma subjects (50%) had more moderate physical activity compared to asthma subjects (19.24%). Very small in asthma subjects (3.84%) and non asthma subjects (7.69%) in performing low physical activity.

The results of normality tests related to physical activity against asthma and non-asthma subjects have a P value (0.185)>α(0.05) so that it can be concluded that the two groups of subjects have data that are normally distributed. The result of homogeneity test related to physical activity in asthma and non asthma subjects has a P value (0.104)>α(0.05), so that it can be concluded that the existing data has the same variant. While the difference test related to physical activity on asthma and non-asthma subjects has a P value (0.000) <α (0.05) so it can be concluded that there are significant differences related to physical activity in the subject of asthma and non asthma.

Effect of Physical Activity on Vitamin D

The results of the correlation test for vitamin D levels and physical activity in asthma and non asthma subjects had an approximate significance value of 0.965. it could be said that the correlation between vitamin D levels and physical activity is very strong (Table 3).

Physical activity has a very strong relationship to vitamin D levels. Physical activity can increase vitamin D levels in the blood. A person who is active in moderate to moderate physical activity for at least 10 minutes per day can increase vitamin D levels in the blood (21). In addition, physical activity both physical activity at home and physical activity outside the home can increase vitamin D levels in the blood (10). So far there has been no research that can describe for sure why physical activity can increase vitamin D levels in the blood, but it has the assumption that physical activity can increase the circulation of vitamin D in the body.

Many factors influence levels of vitamin D in the blood, such as a history of liver disease, a history of kidney disease, and the use of certain drugs that can affect vitamin D levels. The use of closed clothing such as wearing a jacket, wearing headscarves can affect vitamin D levels, where they will be less exposed to sunlight, so the synthesis of vitamin D in the body will be less (22). Apart from the hijab, the color of clothing and the type of clothing will affect vitamin D which can be synthesized. The color of black clothing almost absorbs all types of light, including infrared, visible light and ultraviolet light. When a person uses black clothing, UVB light will be absorbed a

lot in clothing, rather than absorbed by the skin. This causes vitamin D synthesis to decrease (23). In this study, there were research subjects who used the hijab, and also used clothing that varied in color but did not affect vitamin D levels.

Asthma prevalence is higher in women than men (3). High levels of estrogen in women can affect the immune system in the body, such as the change of function of macrophage cells, tissue remodeling, and fibrosis. This change worsens the inflammatory reaction in the body, especially in asthma patients (24). Estrogen can also act as a proinflammatory mediator that triggers inflammation by: 1) increasing the function of antigen cells to develop diseases associated with allergies, 2) triggering mast cells / basophils to integrate, and 3) affecting the function and work of lungs (25). Gender can significantly affect levels of vitamin D in the body, where lower vitamin D levels are found in men than women. Low levels of vitamin D (vitamin D deficiency) can affect the severity of CAD (Coronary Artery Disease) (26). Gender can also significantly affect physical activity carried out by someone. Men tend to do physical activities that are heavier than women because men tend to work and women tend to be in the house (27). In this study, gender did not affect the results of the study because the subjects obtained were students, where subjects tended to have the same physical activity.

Age can affect vitamin D levels in the body because as a person ages, vitamin D metabolism will also decrease. Decreasing vitamin D metabolism can cause: 1) decreased absorption of calcium; 2) the presence of intestinal resistance related to calcium absorption in circulation of 1,25 (OH) D; 3) decrease in production of 1.25 (OH) D by renal; and 4) decreased production of 1,25 (OH) D by skin (28). Lack of vitamin D levels at an older age can also cause a decrease in quality of life, increase the severity of the risk of osteoporosis, and increase the risk of death from cardiovascular disease (29). In addition to age can affect vitamin D metabolism, age can affect the knowledge and attitudes related to vitamin D. In adulthood, the majority of the subjects of this study have heard of vitamin D, but sun-related knowledge as the largest source of vitamin D is inadequate because they avoid sunlight directly by using closed clothes (wearing a jacket, sunscreen, umbrella), and doing a lot of activity inside the house (30). Age can also affect a person's physical activity, where physical activity carried out in old adulthood is lower than in young adulthood, especially in people who live in suburban areas. As a person ages, they become less interested in improving their quality of life, but are more interested in maintaining their current health and the abilities they currently have (31). In this study, age does not affect the physical activity carried out, because the subjects chosen have a small age range. The results of the different tests related to the age of the subject had a $P < 0.103$, which had the conclusion that there were no significant differences related to the age of the subject.

The asthma subjects involved in this study mostly used inhaled short-acting β-2 agonist drugs, which were as many as 19 people (73.08%), which means that all of these research subjects entered into step 1 (3), so there are no subjects who use asthma medication regularly. The mechanism of action of the class of β-2 agonists is the relaxation of the smooth muscle of the airways, decreases vascular permeability, and modulation of mediator release from mast cells (32). The use of inhaled β-2 agonists has the same effectiveness of oral β-2 agonists. The use of inhalation that is local and direct to the respiratory tract requires a smaller dose than systemic use, and also the risk of side effects that may occur smaller (3). Stages in asthma show the course of the severity of asthma, which shows step 1 is the lowest treatment stage. The step determination in the subject of asthma is based on the use of the subject asthma drug. Subjects with more exacerbation symptoms, as well as the use of asthma drugs in the past month has increased, signaling the steps they experienced will also be higher. In this study, subjects with

asthma were found on step 1. Vitamin D has a relationship with the severity and control of asthma, where having enough vitamin D in the blood can prevent various health problems. On the other hand, vitamin D has an important role related to asthma and asthma exacerbations. Increasing levels of vitamin D is beneficial for people with uncontrolled asthma (33).

In this study, most subjects (61.54%) did not take supplements and there were 38.46% of subjects who took supplements but not supplements containing vitamin D. Most of the subjects who took supplements containing vitamin C, supplements for endurance and supplements for the skin. The use of vitamin D supplements at the time of the study will influence the results of the study, where there will be an increase in vitamin D levels in the blood when a person consumes vitamin D supplements.

Differences in vitamin D levels in asthma and non asthma subjects can be influenced by many factors. The factors that influence vitamin D levels in the blood, such as:

a. Dark skin. Vitamin D levels in the blood can be affected by skin color. Dark-skinned people (skin types 5 or 6) have high amounts of melanin pigments compared to those with fair skin (1 or 2 skin types). People with skin type 1 produce 6x more vitamin D than people with skin type 6 (34). The high melanin in the skin will inhibit the process of synthesis of vitamin D from the sun. Melanin will absorb and break up UVB sunlight, which causes a less efficient conversion of 7-dehydrocholesterol to previtamin D3. Dark-skinned people will need longer sun exposure so that vitamin D production can be satisfied (35). In this study, dark-skinned people were not included in the exclusion criteria because researchers could not measure how dark a person was needed to make melanin pigments in the body trigger lower vitamin D production.
b. Obesity. Vitamin D is a fat-soluble vitamin. People with BMI (Body Mass Index) with a value of ≥30 tend to have more fat than people who have a normal BMI (18.5-24.9). As a result of the large amount of fat present in the body, a lot of vitamin D is dissolved in fat, and only a few enter the blood circulation (36). Vitamin D is a fat-soluble vitamin. People with BMI (Body Mass Index) with a value of ≥30 tend to have more fat than people who have a normal BMI (18.5-24.9). As a result of the large amount of fat present in the body, a lot of vitamin D is dissolved in fat, and only a few enter the blood circulation.
c. Kidney illness. Chronic kidney disease can cause abnormalities in the structure and function of the kidneys. Abnormalities in the kidneys can cause phosphate retention. This retention results in a decrease in the activity of 25 (OH) D-1α-hydroxylase so that the levels of 1,25 (OH) D produced by the kidneys will decrease (37). In this study, there were no asthma subjects or non-asthma subjects who had a history of kidney disease. This is done to reduce various things that can affect vitamin D levels in the blood.
d. Age can affect levels of vitamin D in the blood. Older people will have skin aging, where the skin's ability to absorb sunlight will decrease. They will also spend more time in the house. As a result of this, vitamin D levels in their body will decrease.
e. Poor Sleep. Having less sleep can disrupt the circadian rhythms in the body. When people have disturbed circadian rhythms, circulating vitamin D in the blood will also be disrupted. As a result, levels of vitamin D in the blood can decrease (38).

In this study, the 5 most physical activities carried out by the subjects were driving a vehicle such as a car / motorcycle, walking more than 100 meters, cooking, washing, and cleaning the room / house. Physical activity driving a car / motor vehicle enters light physical activity, and physical activity of cooking, washing, and cleaning the room / house enters into heavy physical activity. Subjects who carry out heavy physical

activity have spent at least 100 minutes per week doing heavy activities, which has exceeded the WHO recommendation limit regarding physical activity.

Physical activity can also affect levels of vitamin D in the blood. A study by Fernandes and Junior (2017) (10), t here is an increase in plasma concentration of vitamin D in someone who has physical activity indoors and outdoors. In another study conducted by Wanner et al (2015) (39), in a total of 6,370 subjects aged 18 years and over were measured for vitamin D levels and physical activity. The results of their study that physical activity can be one way to achieve higher vitamin D levels, where physical activity for at least 10 minutes is classified as moderate in a day for at least 7 consecutive days, can increase the circulation of vitamin D is in the blood.

In this study, there were significant differences between asthma and non-asthma subjects related to physical activity, where asthma subjects did more physical activity that was classified as more severe than non-asthma subjects. Many factors can affect a person's physical activity (12):

a) "Day" Factor
   Someone will do more physical activity on weekdays (Monday - Friday) where generally Saturday and Sunday are used to rest or relax (a little physical activity). In addition, the existence of an agenda or agreement in the past week can affect physical activity.
b) "Intrinsic" Factors
   Intrinsic factors are more into things that make a person have a mood in physical activity. A person with a good mood will do more physical activity, while someone with a bad mood will do a little physical activity.
c) "Environmental" Factors
   Environmental factors can be a barrier for someone when they want to do physical activity. When the weather is hot and when the weather is raining it will affect the physical activity carried out.
d) Resource Factors
   The availability of resources (gym, swimming pool, bicycle presence, jogging trajectory) can trigger a person in physical activity. Money and time factors can also be a barrier to physical activity.

Measurement of physical activity can be done in various ways, such as using self-report questionnaires (IPAQ-S, RPAQ, PAR), using accelerometers, and using pedometers. Using self-report questionnaires has the advantage of being inexpensive, not imposing the subject, and getting the flow of physical activity that the subject is doing. The self-report questionnaires method also has weaknesses, which have low accuracy and reliability, because the data is obtained based on the subject's memory. In this study, physical activity measurements did not use accelerometers because of the inability to measure various physical activities. This study also did not use pedometers to measure physical activity because it was limited to physical activity on foot (40).

This research is still far from perfect, there are still many shortcomings and limitations during the study. The limitations or disadvantages of this study are as follows:

1. The number of samples in this study is still relatively small because the research sample is limited to students in one area in Surabaya
2. Many factors can affect vitamin D levels such as color and type of clothing, genetic. It is difficult to ask the subject to wear the same color and type of clothing during the study period, and it is also difficult to determine a person's genetic factors that can affect vitamin D levels.
3. More detailed answers related to physical activity are needed, such as washing physical activity, whether washing with a washing machine or by hand, etc.

CONCLUSION AND SUGGESTION

Test results of differences between subjects with asthma and non-asthma subjects related to

vitamin D levels have a P value (0.000) <α (0.05), meaning that there are significant differences in vitamin D levels between subjects with asthma and non-asthma. In the test results of differences related to physical activity against asthma and non-asthma subjects have P (0.000) <α(0.05) so it can be concluded that there are significant differences in physical activity in asthma and non-asthma subjects. While the results of the correlation test for vitamin D levels and physical activity in asthma and non asthma subjects had an approximate significance value of 0.965, it can be said that the relationship between vitamin D levels and physical activity was very strong.

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