Review Article

Knowledge of sunlight exposure toward obesity in geriatric

Amelia Lorensia[1*], Rivan Virlando Suryadinata[2], Nurul Fitrianingsih[1]

[1] Department of Community and Clinical Pharmacy, Faculty of Pharmacy, University of Surabaya, Surabaya, East Java, Indonesia

[2] Department of Public Health, Faculty of Medicine, University of Surabaya, Surabaya, East Java, Indonesia

[*] Corresponding Author's Email: amelia.lorensia@staff.ubaya.ac.id

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ABSTRACT

Indonesia gets good sun exposure every year. Sunlight is a major source of vitamin D., but studies show that tropical countries still have a high prevalence of vitamin D deficiency. Geriatrics and obesity are some of the factors that can lead to vitamin D deficiency. Lack of information and knowledge about the effects of vitamin D deficiency, concerns about skin cancer from sunburn, and some current trends that want white skin cause them to limit sun exposure. Based on the high prevalence of geriatric and obesity data in Indonesia and the decline of functional status in geriatrics, which is a person's ability to perform daily physical activity, thus limiting himself to outdoor physical activities to expose the sun. Researchers conducted research to see the knowledge of sun exposure. This study was conducted to analyze vitamin D deficiency risk factors by the cross-sectional method to 88 obesity geriatrics and 88 non-obesity geriatrics based on knowledge of sun exposure. Test the risk factor aspects of knowledge using the odds ratio. The result of the odds ratio test of the knowledge aspect is 0.725, so it can be concluded that good knowledge of sun exposure has the same risk in both groups of respondents (obesity and non-obesity).

1. INTRODUCTION

Indonesia, as a tropical country, has warm temperatures and is exposed to sunshine throughout the year. Sunlight is the primary source of vitamin D, which can produce vitamin D in the skin by 80-90% of total vitamin D, while the remaining 10-20% can be produced from food (Pusparini, 2014). Vitamin D deficiency can cause abnormalities in bones called rickets in children and osteomalacia in adults (Rimahardika, Subagio & Wijayanti, 2017). Vitamin D plays an essential role in bone metabolism, maintaining bone health, and is vital for muscle function (Kaji, 2014).

Globally the geriatric population is predicted to continue to increase (Kementerian Kesehatan Republik Indonesia [Kemenkes RI], 2014). In 2015 to 2030, the number of people in the world aged 60 years or more is expected to increase by 56%, from 901 million to 1.4 billion, and by 2050, the global geriatric population is estimated to more than double its size compared to in 2015, reaching nearly 2.1 billion. Over the next 15 years, the number of geriatrics in Indonesia alone reached 20.24 million people, equivalent to 8.03% of the total population of Indonesia in 2014 (Kemenkes RI, 2014). In the geriatric deficiency of vitamin D can cause sarcopenia, osteomalacia, decreased functional status, and can increase the risk (Setiati, 2008). Meeting the needs of vitamin D in geriatrics is one of the efforts needed to overcome various problems caused by an increase in the number of older people due to increased life expectancy. Efforts must be made in overcoming these problems are not only related to the provision of care quality medical services but rather special care for

geriatric protection and interests (Badan Pusat Statistik [BPS], 2014).

The physiological changes in the skin in geriatrics that turn thinner, wrinkled, and inelastic can cause a reduction in the function of the skin as a barrier to environmental temperature so that the skin will be susceptible when exposed to sunlight and will feel hotter when exposed to direct sunlight. This can lead to a tendency to avoid direct sunlight exposure to geriatrics (Zahrudin & Damayanti, 2018; Farage, Miller, Elsner & Maibach, 2013). Also, a decrease in muscle mass in geriatrics can result in a decrease in basal metabolism that causes slowing of peristalsis (contraction and relaxation in the intestinal wall) and muscle tone (healthy tension of the muscles). This problem can result in food entering the long body metabolism so that geriatrics will be very susceptible to obesity, and food intake that occurs continuously followed by a lack of ability to do physical activity properly will lead to a state of accumulation of fat in the body as a result of excess calorie intake resulting in an increased risk of obesity in geriatrics (Amarya, Singh & Sabharwal, 2014; Mathus-Vliegen, 2012).

Obesity is directly dangerous for health because obesity can increase the risk of several diseases such as type 2 diabetes, hypertension, stroke, and heart failure. In geriatric obesity can cause a decrease in metabolic processes that can affect the solubility of some fat-soluble vitamins such as vitamin D, which has fat-soluble properties that can lead to the risk of vitamin D deficiency (Khor et al., 2011). As one of the countries in Asia with a tropical climate, Indonesia gets the right amount of sun exposure every year. The good intensity of sun exposure makes vitamin D very easy to find in Indonesia (Yosephin, Khomsan, Briawan & Rimbawan, 2014). However, the existence of these benefits does not make the Indonesian population avoid the risk of vitamin D deficiency. Research conducted in Jakarta and Bekasi, found that geriatrics who experience vitamin D deficiency is as much as 35.1% (Setiati, 2008). High sunscreen usage can cause vitamin D deficiency among middle-aged women and the more use of umbrellas during the day that is carried out among geriatrics. These behaviors are due to fundamental ignorance and confusion regarding the role of sunlight in producing vitamin D, the benefits of sunlight, as well as the function and source of vitamin D. Most of the population does not like being in the sun and taking action to avoid sunlight (Kung & Lee, 2006). Also, research conducted on a group of teachers, office workers, and geriatrics in Sydney, Australia found several obstacles that could affect the phenomenon, such as lack of information and knowledge about the effects of vitamin D deficiency, concerns about skin cancer due to sunburn, and some current trends for whites to cause them to limit sun exposure. So it can be concluded that a person's knowledge of sun exposure can affect his attitude to sun exposure itself (Bonevski, Bryant, Lambert, Brozek & Rock, 2013). The study aims to determine the differences in knowledge of sun exposure in geriatrics with obesity and non-obesity.

2. MATERIALS AND METHODS

Research Design

This study used a case-control research design that aims to determine the comparison of knowledge of sun exposure in geriatric obesity with non-obesity related to the risk of vitamin D deficiency. The research location chosen for this study is in Puskesmas Taman, Sidoarjo City, East Java, and conducted from September 2017 to January 2018. The independent variables in this study were obese geriatric patients (BMI ≥ 27.0 kg/m^2) and non-obese (BMI < 27.0 kg/m^2). The dependent variable in this study is knowledge of sun exposure. Geriatrics can be classified according to their age into three groups, namely: the initial geriatric period, i.e., someone between the ages of 46-55 years, the final geriatric period, i.e., someone aged 56-65 years, the elderly is someone aged ≥ 65.

Knowledge was everything that is known, intelligence, or everything that was known concerning things (subjects). Besides, that knowledge could also be interpreted as the result of "knowing," and this could occur after someone senses a particular object. Sensing occurred through the five human senses, namely the sense of sight, hearing, smell, taste, and touch. The level of knowledge of a person can affect his attitude in addressing a matter, in this case, is his knowledge of sun exposure that can cause an increased risk of vitamin D deficiency (Kung & Lee, 2006). Knowledge in this study is knowledge about sun exposure in geriatric obesity and non-obese geriatrics, which were measured using a questionnaire. The questionnaire used on this variable uses a questionnaire from a study that was conducted previously (Arora, Dixit & Srivastava, 2016; Al Bathi, Al Zayed, Al Qenai, Makboul & El-Shazly, 2012; Zhou, Zhuang, Yuan, Li & Cai, 2016). There are eleven questions about knowledge of sun exposure; each question item is given a score of 2 on the correct answer. After all of the questionnaires were given a score, they were grouped into two assessment categories, namely good knowledge

and inadequate knowledge. Knowledge value is useful if the respondent's answer score is ≥ 6 and for inadequate knowledge, if the answer score is < 6.

Population and Sample

The population used in this study were all geriatric patients in the Elderly Poly Puskesmas Taman in the city of Sidoarjo, East Java. The sample of this study was drawn from a portion of the population that met the inclusion criteria, such as obese geriatric patients and non-obese geriatric patients who were in the Elderly Poly Puskesmas Taman in the city of Sidoarjo, East Java. The sampling technique used in this study was non-random sampling with a purposive sampling method. Measurement of samples in small indigenous populations smaller than 10,000 can use simple calculations like the following formula:

$$n = \frac{N}{1 + N\,(d)^2}$$

Information:
n = sample size
N = population size
d = level of trust or desired degree of accuracy (0,1)

The N value used is 500, which is obtained from the average number of geriatric visitors with obesity each month in 2017 at the Puskesmas Taman, Sidoarjo. n = 5001 + 500 0.12 = 83 people. So the size of the study sample (n) minimum of each group in this study was 83 people.

Work Method

Validation tests conducted in this study include internal validity and external validity. Internal validity is used to see how far the results or changes that occur in the dependent variable as an influence or result of the treatment. The validation process was carried out by translating the questionnaire into Indonesian and then given to three professional judgments in the field of community pharmacy, then followed by external validation conducted on 30 geriatric respondents who were in Puskesmas Taman Sidoarjo. External validity is used to see how far the results of the study can be generalized to similar or similar subjects or conditions. The validity test was analyzed using the SPSS software program version 24 for windows. Test Validity value of the questionnaire can be declared valid if (*r-count > r-table*).

The reliability test is used to show the extent to which a measuring device can be trusted, so that it can show the extent to which the measurement results remain consistent or remain principle (steady) when measuring two or more of the same symptoms, using the same measuring instrument. Cronbach's alpha values can be said to be reliable if they fall within the range of 0.61 to 0.80.

3. RESULTS AND DISCUSSIONS

Test Research Questionnaire

The questionnaire used in the study has been tested for validity and reliability using the SPSS software program version 24 for windows. Test the validity of the questionnaire can be declared valid if (*r-count > r-table*), where the *r-table* value for 30 respondents is 0.361 and all question items from the questionnaire have a value above the *r-table*. The reliability test results of the knowledge questionnaire on sun exposure can be declared reliable because it has a Cronbach's Alpha value of *p* 0.758 > 0.60.

Characteristics of Respondents

Respondent characteristics used in this study were grouped by sex, age, and BMI (Body Mass Index) (**Table 1**). In both groups, there were more women than men.

BMI (Body Mass Index)

Frequency distribution of respondents based on BMI that respondents with a thin (BMI < 18.5) was 6 people; normal (BMI 18.5-24.9) was 75 people; overweight (BMI 25.0-27.0) was 7 people; and obesity (BMI > 27.0) was 88 people (**Table 2**).

Table 1. Characteristics of the subjects.

Characteristics		Group			
		Obesity		Non-Obesity	
		Frequency (n:88)	Percentage (%)	Frequency (n:88)	Percentage (%)
Gender	Female	70	79.54	50	56.82
	Male	18	20.45	38	43.18
Age (years)	46-55	34	38.64	30	34.09
	56-65	38	43.18	44	50.00
	>65	16	18.18	14	15.91

Table 2. Frequency distribution of Body Mass Index (BMI).

Body Mass Index (BMI) (kg/m^2)		Group			
		Obesity		Non-Obesity	
		Frequency (n:88)	Percentage (%)	Frequency (n:88)	Percentage (%)
Thin	<18.5			6	6.82
Normal	18.5-24.9			75	85.23
Overweight	25.0-26.9			7	7.95
Obesity	>27.0	88	100		
TOTAL		**88**	**100**	**88**	**100**

Knowledge of Sun Exposure

How to obtain research data on knowledge of sun exposure among obese geriatric and non-obese geriatric respondents, is done by giving a score on the question items answered by each respondent (**Table 3 and Table 4**).

There were 75.00% of obese geriatric respondents who had known about vitamin D, and there were 72.73% of non-obese geriatric respondents who had known about vitamin D. The results showed that geriatric respondents with obesity knew more about vitamin D than geriatric respondents non-obese. Vitamin D is most widely known by respondents as a good vitamin for bone health in the amount of 30.68% of geriatric respondents with obesity and by 25.00% of non-obese geriatric respondents who answered with that answer.

Sources of information about vitamin D, amounting to 13.64% of geriatric respondents with obesity, answered, knowing that most vitamin D is the answer coming from schools by 43.18%. Non-obese geriatric respondents also answered that most vitamin D came from schools, which amounted to 32.95%. Pharmacists, as health workers, are expected to be able to design and implement community-based pharmacy services in the promotion of and preventive public health. The promotive effort that can be done is to provide information about the role of sunlight in producing vitamin D, the benefits of sunlight, and the function of vitamin D. Furthermore, preventive efforts can be made to provide advice on efforts to prevent the occurrence of vitamin D deficiency from increasing awareness community to prevent the risk of Vitamin D deficiency (Suryadinata, Lorensia & Wahyuningtyas, 2020).

The biggest source of vitamin D was derived from sunlight (Kung and Lee, 2006). Geriatric respondents with obesity were respondents who know the sun as the largest source of vitamin D with the most amount that is equal to 55.68% compared with non-obese geriatric respondents who answered as much as 43.18%. Vitamin D comes from pro-vitamin 7-dehydrocholesterol on the surface of human skin. With the help of UVB rays found in sun exposure, pro-vitamin 7-dehydrocholesterol on the surface of the skin will be converted into vitamin D3 (cholecalciferol). Sunlight was the main source of vitamin D because sunlight can produce vitamin D in the skin 80-90% of total vitamin D, while the waste can be produced from foods such as seafood, shrimp, mushrooms, egg yolks, and milk as much as 10-20% (Suryadinata et al., 2020).

The benefits of vitamin D for the body include an important role in maintaining calcium and phosphorus in order to remain in a stable condition and function in the formation and maintenance of bones and teeth. Another function of vitamin D is to help harden bones by regulating calcium and phosphorus available in the blood to be deposited in the process of bone hardening and plays an important role in the formation of the immune system (Suryadinata et al., 2020) The most answers answered by geriatric respondents with obesity and non-obese geriatrics are for bone health that is equal to 39.77%, in geriatric respondents with obesity as much as 32.95% in non-obese geriatrics. We have recorded that 45.14% of obese geriatric respondents and 63.63% of

Table 2. Frequency distribution of Body Mass Index (BMI).

No.	Question	Answer	Group			
			Obesity		Non-Obesity	
			Frequency (n:88)	Percentage (%)	Frequency (n:88)	Percentage (%)
1	**Knowing about vitamin D**	**Yes**	66	75.00	64	72.73
		Vitamins for bone health	27	30.68	22	25.00
		Vitamins that are sourced from sunlight	8	9.10	7	7.95
		Vitamins for health throughout the body	3	3.41	6	6.82
		Vitamins that are sourced from sunlight and for bone health	3	4.41	1	1.14
		Vitamins for healthy bones and teeth	3	3.41	1	1.14
		(*5 highest answers*)				
		Don't know	22	25.00	24	27.27
2	**Information source about vitamin D**	Pharmacists / nurses / doctors / other	12	13.64	15	17.04
		School	38	43.18	29	32.95
		Book	9	10.23	11	12.50
		Do not know	35	39.77	42	47.73
		(*5 highest answers*)				
3	**The most significant source of vitamin D**	Vitamin or supplement	2	2.27	2	2.27
		Vegetable	20	22.73	24	17.17
		Sun	49	55.68	38	43.18
		Meat	8	9.09	4	4.54
		Do not know	9	10.23	20	22.73
		(*5 highest answers*)				
4	**Benefits of vitamin D for the body**	For bone health	35	39.77	29	32.95
		To maintain the health of the whole body	8	9.09	9	10.23
		To add power	7	7.95	9	10.23
		For bone and dental health	5	5.68	1	1.14
		Do not know	19	21.59	29	32.95
		(*5 highest answers*)				
5	**As a result of vitamin D deficiency**	Cancer	9	10.23	7	7.95
		Obesity	10	11.36	8	9.09
		Increased cholesterol	17	19.32	15	17.04
		Bone disease	53	60.23	45	51.14
		High blood pressure	10	11.36	9	10.23
		(*5 highest answers*)				
6	**Causes the body's lack of vitamin D**	Use an umbrella during the day	27	30.68	16	18.18
		Sunbathing on the beach	12	13.64	12	13.64
		Perform routine physical activity	14	15.91	19	21.59
		Using closed clothes	23	26.14	21	23.86
		Do not know	11	12.50	17	19.32
		(*5 highest answers*)				
7	**Sunlight can help produce vitamin D**	**Yes**	73	82.95	74	84.09
		Because sunlight is the primary source of vitamin D	19	21.59	21	23.86
		Because sun exposure can nourish the body	10	11.36	10	11.36
		Because of information from doctors	3	3.41	1	1.14
		Because sun exposure is good for bone health	7	7.95	5	5.68
		It is possible	33	37.50	29	32.95
		(*5 highest answers*)				
		No	9	10.23	12	13.64
		Don't know	6	6.82	2	2.27
8	**Sunlight is harmful to the skin**	**Yes**	31	35.23	41	46.59
		Exposed too long	2	2.27	3	3.41
		Because if too often and too long exposure can cause skin cancer	3	3.41	5	5.68
		Because it can result in skin damage	3	3.41	11	12.50
		Because it can cause the skin to become dark	7	7.95	3	3.41
		Exposed during the day	10	11.36	5	5.68

Table 2. *(Continued)*

No.	Question	Answer		Group Group Group Group			
				Obesity		Non-Obesity	
				Frequency (n:88)	Percentage (%)	Frequency (n:88)	Percentage (%)
		No		55	62.5	43	48.86
		If exposed for a short time is not dangerous		24	27.27	7	7.95
		Because it is good for bone health		1	1.14	4	4.54
		Because it can result in a lack of vitamin D if less exposed to sunlight		1	1.14	3	3.41
		Because it is good for health		26	29.54	27	30.68
		Because it is good for skin health		2	2.27	1	1.14
		Don't know		2	2.27	4	4.54
9	**A good time to be exposed to direct sunlight so that the body gets vitamin D**		06.00 WIB	23	26.14	31	35.23
			07.00 WIB	71	80.68	74	84.09
			08.00 WIB	76	86.36	75	85.23
			09.00 WIB	56	63.64	54	61.36
			10.00 WIB	20	22.73	13	14.77
10	**The length of time required by the body to be exposed to direct sunlight in order to obtain vitamin D**		5-15 minute	16	18.18	19	21.59
			15-30 minute	33	37.50	25	28.41
			30-60 minute	21	23.86	22	25.00
			>1 hour	15	17.04	18	20.45
			Don't know	3	3.41	4	4.54
11	**The amount of SPF (Sun Protection Factor) is good for the body**		<15	7	7.95	10	11.36
			>15	9	10.23	5	5.68
			Don't know	72	81.82	73	82.95

non-obese geriatrics do not know what the benefits of vitamin D for the body.

As a result of vitamin D deficiency can cause abnormalities in the bones called rickets in children and osteomalacia in adults. Geriatric vitamin D deficiency can also cause osteoporosis. Rickets occurs when the hardening of the bones in children is blocked so that it becomes soft. Legs are bent, the ends of long bones are enlarged (knees and wrists), ribs are bent, enlargement of the head due to late closure of the fontanel, teeth come out irregularly and are easily damaged (Suryadinata et al., 2020). Geriatric obese respondents answered 10.23% for cancer, 11.36% for obesity, 19.13% for increased cholesterol, 60.23% for bone disease, 11.36% for high blood pressure, 1.14% for disease yellow and 9.09% answered they don't know. Whereas in non-obese geriatrics answered as much as 7.95% for cancer, 9.09% for obesity, 17.04% for elevated cholesterol, 51.14% for bone disease, 10.23% for high blood pressure, 1.14 % for jaundice, 4.54% for fatigue and 9.09% answered not knowing.

The cause of the body's lack of vitamin D related to sun exposure is to use an umbrella during the day, use closed clothing (Qureshi, Zia, Gitay, Khan & Khan, 2015), and use sunscreen (Holick, 2007) because it can inhibit the formation of vitamin D in the skin by ultraviolet rays originating from sunlight (Suryadinata et al., 2020). Obesity geriatric respondents who answered the use of umbrellas during the day were 30.68%, sunbathing on monitor 13.64%, doing routine physical activity 15.91%, using closed clothes 26.14%, using sunscreen as much as 11.36%, consuming fewer vegetables and fruits as much as 6.82%, and answered not knowing as much as 12.59%. Whereas the non-obese geriatric respondents who answered the use of umbrellas during the day were 18.18%, basking in the monitor 13.64%, doing routine physical activities 21.59%, using closed clothes 23.86%, using sunscreen 11.36%, consuming fewer vegetables and fruits 5.68%, irregular eating patterns as much as 4.54%, and answering not knowing as much as 12.59%. The causes of decreased vitamin D synthesis can be divided into several things, including dark skin color, use of sunscreen, how to dress that is covered and sheltered in the shade (Suryadinata et al., 2020). Efforts to overcome the occurrence of vitamin D deficiency is to

Table 3. Knowledge cross tabulation of sun exposure.

Knowledge of Sunshine Exposure		Group				TOTAL
		Obesity		Non-Obesity		
Number of True Questions	Knowledge Categories	Frequency (n:88)	Percentage (%)	Frequency (n:88)	Percentage (%)	
≥6	GOOD	51	57.95	44	50.00	95
<6	BAD	37	42.04	44	50.00	81
TOTAL		88	100.00	88	100.00	176

familiarize the body to be exposed to direct sunlight at hours and sufficient exposure time for the formation of vitamin D in the skin (Holick, 2007; Suryadinata et al., 2020; Sadat-Ali, Al-Anii, Al-Turki, AlBadran & AlShammari, 2018)

Sunlight can help produce vitamin D in the body. Ultraviolet contained in sunlight can form vitamin D in the skin (Suryadinata et al., 2020). Obesity geriatric respondents who answered sunlight could help produce vitamin D as much as 82.95%, and those who answered sunlight could not help produce vitamin D as much as 10.23%, and those who answered did not know as much as 6.82%. Whereas non-obese geriatric respondents who answered sunlight could help produce vitamin D as much as 84.09%, and those who answered sunlight could not help produce vitamin D as much as 13.64%, and those who answered did not know were 2.27%.

Exposure to sunlight can be said to be dangerous but can also be said to be harmless. Exposure to sunlight is harmful to the skin if it is too long and too often exposed to sunlight because it can cause skin cancer, but vitamin D is also not harmful to the skin because it contains UVB rays that can help the formation of vitamin D in the skin (Suryadinata et al., 2020). Respondents who answered that sunlight was harmless to the skin were 62.5% of geriatric obese respondents and 48.86% of non-obese respondents. There were 27.27% of respondents of geriatric obesity who answered that the reason is that brief exposure was not dangerous. In comparison, 7.95 % non-obese geriatric said that sun exposure is good for bone health 1.14% obese geriatric and 4.54% non-obese geriatric, because it can cause vitamin D deficiency if less exposed to sunlight as much as 1.14% geriatric obesity and as much as 3.41% of non-obese geriatrics. Some respondents of obese geriatric answered that sunlight was dangerous to the skin 35.23%, and 46.59% of non-obese respondents answered because of long exposure. However, 2.27% of obese respondents and 3.41% of non-obese respondents answered that frequent and long exposure could cause skin cancer. In addition, there are also respondents who answered not knowing as much as 2.27% of obese geriatric respondents and as many as 4.54% of non-obese respondents. The best sun exposure is at 11:00 to 14:00 West Indonesia Time for 15 minutes because the intensity of UV B at 11.00 West Indonesia Time is relatively stable and high until 14.00 West Indonesia Time (Holick, 2007).

A good time for exposure to sunlight is from 11:00 to 14:00 WIB because the intensity of UVB sunlight is low at 07.00 WIB, increasing in the following hours until 11:00 WIB. After 11.00 WIB, the UVB intensity is relatively stable and high until 14.00 WIB, then decreases until 16.00 WIB reaching the same intensity at 07.00 WIB (Holick, 2007; Suryadinata et al., 2020). Respondents who answered at 06.00 WIB were 26.13% of obese geriatric respondents and 35.23% of non-obese geriatric respondents. Respondents who answered at 07.00 WIB were 80.68% of obese geriatric respondents and 84.09% of non-obese geriatric respondents. Respondents who answered at 08.00 WIB were 86.36% of geriatric obese respondents and 85.23% of non-obese geriatric respondents. Respondents who answered at 09.00 WIB were 63.64% respondents were obese geriatric, and 61.36% were non-obese geriatric respondents. Respondents who responded at 10:00 WIB were 22.73% of obese geriatric respondents and as much as 14.77% of non-obese geriatric respondents. Respondents who answered at 11.00 WIB were 5.68% of geriatric obese respondents and as many as 11.36% of non-obese geriatric respondents. Respondents who answered at 12.00 WIB were 2.27% of geriatric obese respondents and 4.54% of non-obese geriatric respondents. Respondents who answered at 13.00 WIB were 1.14% obese geriatric respondents and as many as 1.14% non-obese geriatric respondents. Respondents who answered at 06.00 WIB were 1.14% obese geriatric respondents.

The best duration of exposure when the UVB intensity is relatively stable and high at 11:00 to 14:00 WIB is for 15 minutes, but if the exposure time begins to be more awake, then the duration of exposure will be longer, namely for 30 minutes (Holick, 2007). Respondents who answered 5-15 minutes were 18.18% of geriatric obese respondents and 21.59% of non-obese respondents. Respondents who answered 15-30 minutes were 37.50% of geriatric obese respondents and 28.41% of non-obese respondents. Respondents who answered 30-60 minutes

were 23.86% of geriatric obese respondents and 25.00% of non-obese respondents.

The use of sunscreen can cause an increase in vitamin D deficiency because sunscreen with SPF (Sun Protection Factor) 8 can reduce skin vitamin D production by 95% and will increase to 98% when using sunscreens with SPF ≥ 15 (Suryadinata et al., 2020). Respondents who answered more than 15 were 10.23% of obese geriatric respondents and 5.68% of non-obese geriatric respondents. While those who answered less than 15 were 7.95% of obese geriatric respondents and as many as 11.36% of non-obese geriatric respondents. However, there were still many respondents who answered that they did not know about the amount of SPF that was good for the body, namely 81.82% of obese geriatric respondents and 82.95% of non-obese geriatric respondents

The results of the odds ratio analysis of knowledge of sun exposure among obese geriatric and non-obese geriatric respondents can be used to see the risk comparison between the two groups of respondents. A comparison of these risks can be measured by the POR (Prevalence Odds Ratio), where the OR value is 0.725, with a significant level of 95% CI 0.400-1.315. The POR results obtained show that the obese geriatric respondent group tends to have poor knowledge is 0.7 times higher than the non-obese geriatric respondent group, or in other words, the obese group tends to have good knowledge is 1.4 times greater than the non-obese geriatric respondent group.

Chi-Square Test of knowledge of sun exposure on obese geriatric and non-obese geriatric respondents aims to see the differences in knowledge of sun exposure between groups of obese geriatric and non-obese geriatric respondents. The Chi-Square test results show that the Asymptotic Significance value is 0.290 (> 0.05), so it can be concluded that there is no significant difference in knowledge of sun exposure among obese geriatric and non-obese geriatric respondents. Previous research in Surabaya by Lorensia, Suryadinata & Amir (2019), there was no relationship between vitamin D blood levels of asthma respondents and the level of knowledge about sun exposure associated with vitamin D (*p-value* (0.444) > 0.05). There was no relationship between vitamin D blood levels of asthma respondents and attitudes to sun exposure associated with vitamin D (*p-value* (0.768) > 0.05). The level of knowledge and attitude towards sun exposure associated with vitamin D has no relationship, and the relationship is relatively low (0.093). In conclusion, there is no correlation between vitamin D levels with knowledge and attitude, and there is no correlation and the low relationship between knowledge and attitude.

4. CONCLUSIONS

Obese geriatric respondents had better knowledge of sun exposure than non-obese geriatric respondents, and there was no significant knowledge difference in obese geriatric and non-obese geriatric respondents. Knowledge of sun exposure in geriatric obesity and non-obese geriatrics has a very weak correlation.

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