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Comparison of Vitamin D Intake and Ultraviolet Light Exposure in Pre and Postmenopausal Women in the Elderly Pandemic Period in Padang City

Syahrial[1*], Resmiati[1],Ricvan Dana Nindrea[2], Faiz Nur Hanum[3]

[1]Department of Public Health Nutrition, Faculty of Public Health, Universitas Andalas, Padang, Limau Manis, Sumatera Barat 25175 , Indonesia
[2]Medical Faculty, Universitas Andalas, Jalan. Perintis Kemerdekaan 94, Padang, Sumatera Barat 25127, Indonesia
[3]Department of Nutrition, Universitas Mohammad Natsir Yarsi Bukittinggi, Jalan Tan Malaka, Bukittinggi, Sumatera Barat 26138, Indonesia
**Correspondence*: abilwawa@gmail.com

ABSTRAK

Latar Belakang: *Vitamin D dapat memperlambat proses terjadinya osteoporosis, karena vitamin D mampu memelihara kesehatan tulang dengan cara meningkatkan penyerapan mineral kalsium. Osteoporosis merupakan salah satu penyakit degeneratif pada lansia yang masih menjadi masalah kesehatan prioritas di Indonesia. Osteoporosis dapat terjadi pada wanita yang mengalami menopause, baik pramenopause maupun postmenopause.Terdapat beberapa pencegahan yang dilakukan untuk mencegah kejadian osteoporosis, salah satunya adalah konsumsi makanan sumber vitamin D. Vitamin D dapat diperoleh melalui paparan sinar matahari dan sumber makanan. Pandemi Covid-19 menyebabkan masyarakat harus selalu berada di dalam rumah untuk membatasi aktivitas diluar ruangan sehingga menyebabkan kurangnya paparan sinar matahari sebagai salah satu bentuk sumber vitamin D.*
Tujuan: *Tujuan penelitian ini melihat bagaimana perbandingan asupan vitamin D dan keterpaparan sinar Ultraviolet pada wanita pre dan postmenopause pada masa pandemi.*
Metode: *Penelitian ini merupakan penelitian analitik yang dilakukan dengan disain cross sectional, dimana membandingkan variabel prediktor dan variabel outcome yang dilihat secara bersamaan. Penelitian dilakukan pada wanita usia 35-65 tahun di Posyandu Lansia Kota Padang pada bulan Maret- Juli 2020. Instrumen yang digunakan adalah kuesioner konsumsi makan dan kuesioner. Kemudian hasil data yang didapatkan akan dilakukan analisis hubungan dengan menggunakan uji Anova.*
Hasil: *Hasil penelitian diketahui persentase responden menopause terpapar sinar UV lebih tinggi (87,5%) dibandingkan dengan tidak terpapar sinar UV (12,5%). Kemudian pada persentase responden menopause berdasarkan konsumsi Vit D <AKG lebih tinggi (52,5%) dibandingkan konsumsi Vit D >AKG (47,5%). Tidak terdapat perbedaan signifikan (p<0,05) antara kejadian menopause dengan kadar asupan vitamin D (p=0,381) dan paparan sinar UV (p=0,462) pada lansia di Posyandu Lansia Kota Padang*
Kesimpulan: *Berdasarkan hasil analisis hubungan, tidak terdapat hubungan yang signifikan antara kejadian menopuse dengan kadar asupan vitamin D dan paparan sinar UV pada wanita lanjut usia di Posyandu Kota Padang. Dari hasil penelitian ini diharapkan masyarakat dapat lebih memperhatikan manfaat dari vitamin C dan paparan sinar matahari untuk kesehatan.*

KATA KUNCI*: Vitamin D; Sinar UV; pandemi COVID-19*

ABSTRACT

Background: *Vitamin D can slow down the process of osteoporosis, because vitamin D is able to maintain bone health by increasing the absorption of the mineral calcium. Osteoporosis is one of the degenerative diseases in the elderly which is still a priority health problem in Indonesia. Osteoporosis can occur in women who experience menopause, both premenopausal and postmenopausal. There are several precautions that can be taken to prevent osteoporosis, one of which is the consumption of food sources of vitamin D. Vitamin D can be obtained through exposure to sunlight and food sources. The Covid-19*

pandemic causes people to always stay indoors to limit outdoor activities, causing a lack of exposure to sunlight as a form of vitamin D source.

Objectives: *The purpose of this study is to compare vitamin D intake and UV exposure in pre and postmenopausal women during the pandemic.*

Methods: *This study is an analytic study conducted with a cross sectional design, which compares the predictor variables and outcome variables that are viewed simultaneously. The study was conducted on women aged 35-65 years at the Elderly Posyandu in Padang City in March-July 2020. The instruments used were food consumption questionnaires and questionnaires. Then the results of the data obtained will be analyzed using the Anova test.*

Results: *The results showed that the percentage of menopausal respondents exposed to UV light was higher (87.5%) than not exposed to UV light (12.5%). Then the percentage of menopausal respondents based on the consumption of Vitamin D < RDA was higher (52.5%) than the consumption of Vit D > RDA (47.5%). There was no significant difference ($p<0.05$) between the incidence of menopause and levels of vitamin D intake ($p=0.381$) and UV light exposure ($p=0.462$) in the elderly at the Elderly Posyandu, Padang City.*

Conclusions: *Based on the results of the relationship analysis, there was no significant relationship between the incidence of menopause with levels of vitamin D intake and UV light exposure in elderly women at the Posyandu in Padang City. It is hoped that there will be high public awareness, especially women, to consume sources of vitamin D and be exposed to UV rays regularly to help better absorb vitamin D in the body.*

KEYWORDS*: Vitamin D; UV Rays; Pandemic COVID-19*

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INTRODUCTION

One of the benchmarks for the success of health development is the increase in life expectancy. With the increasing life expectancy of the population, the number of elderly people continues to increase from year to year. Based on the 2011 United Nations report, in 2000 – 2005 the life expectancy was 66.4 years (with the percentage of the elderly population in 2000 being 7.74%), this number will increase in 2045 - 2050 which is estimated to be 77.6 years old (with the percentage of the elderly population in 2045 is 28.68%). Half of the world's elderly (400 million people) are in Asia and the growth of the elderly population in developing countries is higher than in developed or developing countries. Indonesia as a developing country will also experience a population explosion in the elderly (elderly). The elderly population in Indonesia is predicted to increase at a higher rate than the elderly population in Asia and globally after 2050. As a consequence, problems related to old age will require more attention in the future (1). Based on research by Nawi *et al*, shows that quality Indonesian population which is more or less found in the elderly, women, low level of education, not working, living in the countryside and social economy is low. It also important to take care and have an effort in improving the quality of life.

The biggest problem for the elderly (elderly) is degenerative disease. It is because around 75% of elderly people with degenerative diseases can't do activities (stay at home) (1). The most common diseases in the elderly based on Basic Health Research in 2018 were heart disease (1.5%), hypertension (34.1%), and diabetes mellitus (3.4%).

Basically the disease suffered by the elderly is rarely with a single diagnosis, but almost always multidiagnosis. Around 34.6% of elderly suffer from one disease, about 28% with 2 (two) diseases, around 14.6% with 3 (three) diseases, around 6.2% with 4 (four) diseases, around 2.3% with 5 (five)

diseases, about 0.8% with 6 (six) diseases, and the rest with seven or more diseases. Only less than 15% are not sick. From the results of the Basic Health Research Indonesia report for the registration of causes of death in 15 districts/cities in 2018 the highest proportion of causes of death in the elderly group (aged 55-64 years and >65) was Stroke and Ischemic heart diseases, DM, and TB (2)

Another degenerative disease in the elderly that is often forgotten or has not become a priority is osteoporosis. In fact, this disease makes the elderly experience dependence or become elderly who are not independent, in the sense that it greatly interferes with the quality of life of the elderly. Osteoporosis is a reduction in bone mass with a normal mineral to matrix ratio, usually associated with pathological fractures or fractures(3). Osteoporosis is also a very large public health problem, in the United States the epidemic is currently more than 20 million people(4).

Based on the Data and Information Center of the Ministry of Health of the Republic of Indonesia in 2013, the incidence of osteoporosis in women aged 50-80 years was 23% and in women aged 70-80 years was 53% (5). Based on the results of the analysis of osteoporosis risk data (by the Center for Research and Development of Nutrition and Food in 16 regions in Indonesia on 126,265 people, it shows that around 200 million people stricken by osteoporosis risk in 2013 . However, the samples measured were mall visitors or agency employees). government/private sector who voluntarily check their bone density at the promotion site for milk produced by PT FBI. Until now, there is no epidemiological data on osteoporosis in Indonesia. Information is available on the major problem of osteoporosis (population-based study) and factors related to the risk of osteoporosis become important in the context of developing programs to prevent or reduce the incidence of osteoporosis in Indonesia (6).

There are several precautions that can be taken to prevent the occurrence of osteoporosis, one of which is vitamin D. Vitamin D can be obtained through exposure to Ultraviolet (UV) rays from the sun as well as from food sources (7). Vitamin D can slow down the process of osteoporosis, because vitamin D is able to maintain bone health by increasing the absorption of the mineral calcium from the digestive system and reducing its excretion through the kidneys. In order for absorption and disposal to run optimally, the body needs at least 400 IU of vitamin D per day. The ability to absorb vitamin D will decrease with age, so it is necessary to add sufficient foods containing vitamin D such as milk and its processed products, egg yolks, and marine fish. Based on research by Linda Fondjo et al, vitamin D is a steroid hormone known for its essence in maintaining calcium homeostasis and maintaining bone health and increasing immune function (7). Based on Martini et al's research, there was a positive relationship between the incidence of osteoporosis and the age of 45 years and over where the main factor was related to low bone mineral, causing low bone density in the elderly. Based on Martini et al's research, there was a positive relationship between the incidence of osteoporosis and the age of 45 years and over where the main factor was related to low bone mineral, causing low bone density in the elderly (8). Vitamin D plays an important role in calcium and phosphate metabolism which is useful for maintaining serum calcium levels for bone mineralization (8). This is evidenced by the research of Arantes et al which stated that as many as 1,933 women in the city of Brazil who experienced vitamin D deficiency with an average of 0.28 ng/mL experienced an increase in the incidence of osteoporosis and fractures (8).

The ratio of the incidence of osteoporosis in women and men is 4:1 (80%: 20%). This happens because men have large bodies, denser bones and more bone mass than women. In addition, women have lower bone mass due to menopause, resulting in a decrease in the hormone estrogen which causes osteoblast cell activity to decrease while osteoclasts increase (3). If women fail to produce enough estrogen, they will lose bone mass more quickly. And for women who experience menopause early, it has a double effect on the risk of osteoporosis. There is still a lack of data related to the incidence of osteoporosis in areas of Indonesia, especially in the city of Padang and also related research that connects the elderly factor and the researchers are interested in conducting a study entitled

"Comparison of Vitamin D Intake and Exposure to Ultraviolet in Pre and Post Menopause Women at Posyandu Padang City Elders".

MATERIALS AND METHODS

This research is an analytic study conducted with a cross sectional research design, which compares predictor variables and outcome variables that are viewed simultaneously. The study was conducted in the city of Padang, in selected elderly posyandu who are still active with their elderly activities. The study was conducted from March - July 2020 with the population of this study being pre and post-menopausal women aged 35 - 65 years who came to visit the posyandu for the elderly in Padang City. Subjects were taken proportionally based on the number of elderly in each elderly posyandu

Types of data collected include primary data and secondary data:

1. Primary data is data taken directly by researchers such as data on factors related to osteoporosis such as vitamin D intake, menopause and data on exposure to ultraviolet light
2. Secondary data, namely data obtained from hospitals such as data about the general description of the hospital, the identity of the respondent and the nutritional status of the respondent.

The method of data collection consists of:

1. Vitamin D intake was collected by conducting a nutritional history interview using the FFQ form and 24-hour Food Recall
2. Exposure to ultraviolet light was collected by conducting interviews using a simple questionnaire
3. Age was collected by conducting interviews using a simple respondent identity form
4. Nutritional status (body mass index) was collected with measurements made by nutrition enumerators.
5. Menopause was collected by conducting interviews using a simple questionnaire

Data analysis used univariate analysis and bivariate analysis where univariate analysis was carried out on each variable to provide descriptive data for each variable which included intake of Vitamin D served and exposure to ultraviolet light and the number of pre and post menopausal women. Then a bivariate analysis was performed to compare the two variables, such as comparing calcium intake, vitamin D intake, and exposure to ultraviolet light in the two groups. To compare the two variables, the ANOVA statistical test was used with a significance level (α) of 0.05.

RESULTS AND DISCUSSIONS

Genera description of respondents

Age

The description of respondents by age category can be seen in the following table

Table 1. Frequency Distribution of Respondents by Age Category

Umur	TM	N (%)	M	N (%)
<48 yo	30	75	10	25
>48 yo	10	25	30	75
Total	40	100	40	100

Based on **Table 1**, it can be seen that the percentage of menopause respondents in the age category above 48 years is higher (75%) than under 48 years (25%). Meanwhile, for non-menopausal respondents, it can be seen that the percentage of non-menopausal respondents in the age category under 48 years was higher (75%) than those above 48 years (25%). Based on the results of the study, it was found that women aged above 48 years and menopause were more than women aged under 48 years with menopause. The results of this study are in line with the statement from the World Health Organization (WHO) which states that women aged >45 years are more at risk of experiencing menopause, which is one of the factors for osteoporosis in women (9). Menopause is the permanent cessation of a person's menstruation at the end of the fertile period (10). The range of menopause can occur from the age of 45-48 years. Menopause and osteoporosis are two conditions that affect women, because of their relationship with the cessation of the production of the ovarian

endocrine glands to produce estrogen. Reduced estrogen in the body greatly affects 300 body functions (11). From the quantitative data that the researchers got, we can conclude that not all women with the age category > 48 years have experienced menopause. This goes back to the factors that trigger menopause, one of which is the lack of adequate nutritional intake, resulting in disruption of metabolic processes and hormone formation, including estrogen.

Body Mass Index (BMI)

The description of respondents based on BMI category can be seen in the following table

Table 2. Frequency Distribution of Respondents by BMI Category

Kategori IMT	M	N (%)	TM	N (%)
thin	0	0	1	2.5
Normal	15	37.5	11	27.5
Obesity	25	62.5	28	70
Total	40	100	40	100

Based on Table 2, it can be seen that the percentage of menopausal respondents in the Thin BMI category is the least (1.2%) compared to the Normal BMI (30.5%) and Obesity BMI (62.2%) categories which are the highest percentages of the respondents. Then, it can be seen that the percentage of respondents who are not menopausal in the Thin BMI category is the least (2.5%) compared to the Normal BMI category (27.5%) and Obesity BMI (70%) which is the highest percentage of the respondents. Based on the results of the study, there were respondents with a thin BMI category with menopause at 0% and a non-menopausal thin BMI category at 2.5%, a normal BMI category with menopause at 37.5% and a normal BMI not menopause at 27.5%, category. For the obesity BMI category, 70% of respondents were not menopausal compared to 62.5% of menopausal respondents. The results of this study are in line with Rambe's research which stated that his research respondents were in the Underweight category at 0%, in the normoweight category at 47.2%, in the Overweight category at 27.8% and in the obesity category at 25% (12).

Menopausal Status

The description of respondents by category of menopausal status can be seen In the following table

Table 3. Frequency Distribution of Respondents by Menopausal Category

Menopausal Status	N	%
Menopausal	40	50
Not Menopausal	40	50
Total	80	100

Based on table 3, it can be seen that the percentage of respondents in the menopausal and non-menopausal categories is balanced (50%). Based on the results of the study, it was found that the large percentage of obese respondents compared to others showed a high risk of degenerative diseases that mostly infect adults and the elderly (13). Several factors that cause obesity include uncontrolled intake, lack of physical activity, and genetics. In addition, excess obesity in postmenopausal women is associated with decreased bone mass, due to excess leptin levels (14). Based on the results of the study, the number of respondents with menopause and non-menopausal respectively was 50%. Rambe's research stated that the length of the menopause period of the most respondents amounted to 20 people out of 36 respondents (12).

Univariate Analysis

Consumption Pattern

SQ-FFQ Analysis

The description of the respondents based on the SQ-FFQ analysis is shown in the following table

Table 4. Frequency Distribution of Respondents Based on SQ-FFQ Analysis

Analisa SQ-FFQ	M	N (%)	TM	N (%)
below average	26	65	24	60
Normal	14	35	16	40
Total	40	100	40	100

Based on Table 4, it can be seen that the percentage of menopausal respondents in the SQ-FFQ analysis category with a score below the

average was higher (65%) compared to the SQ-FFQ analysis with a normal score (35%). And it can be seen that the percentage of respondents who are not menopausal in the SQ-FFQ analysis category with a score below the average is higher (60%) compared to the SQ-FFQ analysis with a normal score (40%). The results of the survey show that the variety of food consumed by respondents, both postmenopausal and non-menopausal, is at risk of limited micronutrient intake, because the more varied the types of food consumed, the more complete the micronutrients consumed. If the micronutrients consumed are not complete, it will cause a deficiency of certain nutrients so that it interferes with the metabolism of nutrients, one of which is the disruption of function and hormone production. Pancamenopausal osteoporosis that occurs after menstruation stops as a result of low estrogen hormone that occurs at the age of 55-70 years (15).

Analysis of Vitamin D Consumption

the description of respondents based on Vitamin D consumption can be seen in the following table

Table 5. Frequency Distribution of Respondents Based on Vitamin D Consumption

Vit D Consumption	M	N (%)	TM	N (%)
<RDA	21	52.5	24	60
>RDA	19	47.5	16	40
Total	40	100	40	100

Based on Table 5, it can be seen that the percentage of menopausal respondents based on the consumption of Vitamin D < RDA is higher (52.5%) than the consumption of Vit D > RDA (47.5%). And it can be seen that the percentage of respondents who are not menopausal based on the consumption of Vitamin D < RDA is higher (60%) than the consumption of Vit D > RDA (40%). Based on the results of the study, it was shown that the lack of vitamin D intake in both postmenopausal and nonmenopausal respondents, which is feared to cause vitamin D deficiency, which affects the disruption of calcium absorption in the intestines and leads to accelerated bone loss. The role of vitamin D is related to the function of vitamin D (1,25 dehydroxycholecalciferol) in increasing calcium absorption in the intestine (16)

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Sun Exposure (UV)

The description of respondents based on UV exposure can be seen in the following table

Table 6. Frequency Distribution of Respondents Based on UV Exposure

UV Exposure	M	N (%)	TM	N (%)
Exposed	35	87.5	37	92.5
Not exposed	5	12.5	3	7.5
Total	40	100	40	100

Based on Table 6, it can be seen that the percentage of menopausal respondents exposed to UV light was higher (87.5%) compared to those who were not exposed to UV light (12.5%). And it can be seen that the percentage of non-menopausal respondents exposed to UV light was higher (92.5%) compared to those who were not exposed to UV light (7.5%). Based on the results of the study, it was found that there were more respondents who were often exposed to UV rays in respondents who were not menopausal by 92.5%. This is due to the high awareness of respondents about the benefits of exposure to UV rays, one of which is the recommendation to sunbathe during the Covid-19 pandemic. Older women synthesize less vitamin D in the skin, so they need 20 minutes more sun exposure than young women to form adequate amounts of vitamin D (16).

Table 7. ANOVA Test Results Comparison of Menopause and Non-Menopausal Respondents Consumption

	N		Mean	SD	p-value
Vit D	80	Menopausal	13.48	3.274	0.381
		Not menopausal	13.98	1.476	
UV Exposure	80	Menopausal	1.88	0.335	0.462
		Not menopausal	1.92	0.267	

Based on Table 7, the results of the Anova test obtained p-value > 0.05 in the Vitamin D intake and UV exposure groups. The average intake of

Vitamin D in the Menopause group was 13.48 ng/mL lower than the non-menopausal group by 13.98 ng/mL. Based on bivariate analysis, there is no relationship between the incidence of menopause and levels of vitamin D intake in the elderly at the Elderly Posyandu, Padang City.

The average UV exposure in the Menopause group was 1.88 lower than the non-menopausal group by 1.92. Based on bivariate analysis, there is no relationship between the incidence of menopause and UV exposure in the elderly at the Elderly Posyandu, Padang City. Based on bivariate analysis, there is no relationship between the incidence of menopause and levels of vitamin D intake in the elderly at the Elderly Posyandu, Padang City. The average UV exposure in the Menopause group was 1.88 lower than the non-menopausal group by 1.92. Based on the bivariate analysis, there was no relationship between the incidence of menopause with Vitamin D levels and UV exposure in the elderly at the Elderly Posyandu, Padang City. Vitamin D synthesized in the skin or absorbed through the intestine is hydroxylated in the liver by the enzyme 25-hydroxylase. Further metabolism in the kidney leads to the formation of the active metabolite 1,25(OH)2 vitamin D3 (calcitriol). This molecule is important for bone health and affects bone mineralization and calcium absorption in the intestine. The decrease in 25 hydroxylase activity is responsible for the decrease in bone mass. UV exposure is highly recommended for the absorption of vitamin D for the body. Based on Oemardi's research, the incidence of vitamin D deficiency is quite high. Oemardi's study, stated that the rate of vitamin D deficiency in the female population aged 45-55 years was 50%, greater than the rate of vitamin D deficiency obtained from this study (35.1%). This finding shows that the latitude of a country does not fully determine vitamin D status. Sufficient sunlight, as in Indonesia, does not guarantee the absence of vitamin D deficiency (17).

CONCLUSIONS AND RECOMMENDATIONS

Menopause is a normal phase of a woman's life. Menopause was established after 12 consecutive months of not menstruating and there were no other pathological or physiological causes. Usually this menopause occurs in women, where women will experience a decrease in the hormone estrogen which causes the activity of osteoblast cells to decrease, thereby increasing the risk of osteoporosis. The incidence of osteoporosis can be prevented by one of the recommendations is to consume vitamins and adequate exposure to UV rays.

Based on the analysis of the relationship in this research, there was no relationship between the incidence of menopause with levels of vitamin D intake and UV light exposure in the elderly at the Elderly Posyandu, Padang City. The average UV exposure in the Menopause group was 1.88 lower than the non-menopausal group by 1.92. Production of vitamin D requires skin exposure to UVB radiation, which may be obtained year-round in tropical countries. Ultraviolet B rays from the sun will be absorbed by the skin and then convert 7-dehydrocholesterol in the skin into previtamin D3, then spontaneously converted to vitamin D3 and then undergo metabolism in the liver to 25(OH)D and 1,25(OH)2D3 .

Based on the results of the study, it is hoped that there will be high public awareness, especially women, to consume sources of vitamin D and be exposed to UV rays regularly to help better absorb vitamin D in the body. Adequate levels of vitamin D and UV exposure are expected to help prevent the risk of osteoporosis at menopause.

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