CoMPHI Journal: Community Medicine and Public Health of Indonesia Journal
Vol. 5, No. 3, Bulan Februari Tahun 2025, hlm. 236-246

e-ISSN 2722-8169
p-ISSN 2723-097X

KNOWLEDGE-ATTITUDE HEALTH BEHAVIOUR AND VITAMIN D STATUS DURING EPIDEMIC COVID-19

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ABSTRAK

Defisiensi vitamin D atau kekurangan vitamin D dapat meningkatkan kejadian penyakit pernafasan. Masyarakat kurang memiliki pengetahuan dan sikap terhadap masalah kesehatan. Tujuan penelitian ini adalah untuk mengetahui hubungan status vitamin D dengan pengetahuan-sikap perilaku kesehatan tentang vitamin D. Jenis penelitian yang digunakan adalah desain penelitian cross-sectional. Lokasi penelitian yang digunakan dalam penelitian ini adalah di sekitar wilayah Surabaya mulai bulan Maret-Juli 2022. Lokasi penelitian dilakukan di Kecamatan Rungkut, Surabaya, Indonesia. Variabel yang digunakan adalah status vitamin D dan pengetahuan serta sikap terhadap kesehatan merokok. Perilaku tentang vitamin D. Hubungan antara status vitamin D dengan pengetahuan dan sikap terhadap kesehatan merokok. Perilaku tentang vitamin D menggunakan koefisien kontingensi. Tidak terdapat hubungan yang signifikan antara status vitamin D dengan pengetahuan tentang kesehatan merokok. Perilaku tentang vitamin D (p=0.685), namun terdapat hubungan yang signifikan dengan status vitamin D dan sikap terhadap kesehatan merokok. Perilaku tentang vitamin D, namun hubungannya rendah atau lemah (p=0,000). Sikap positif akan mengurangi risiko kekurangan vitamin D yang dapat meningkatkan sistem kekebalan tubuh di masa pandemi COVID-19.

Kata kunci: *Sikap, Pengetahuan, Status Vitamin D*

ABSTRACT

Vitamin D deficiency or vitamin D deficiency can increase the incidence of respiratory diseases. The community lacks knowledge and attitude towards health problems. The purpose of this study is to determine the relationship between vitamin D status and knowledge of health behaviors about vitamin D. The type of research used is a cross-sectional research design. The research location used in this study is around the Surabaya area from March-July 2022. The location of the research was carried out in Rungkut District, Surabaya, Indonesia. The variables used were vitamin D status and knowledge and attitudes towards smoking health. Behavior about vitamin D. The relationship between vitamin D status and knowledge and attitudes towards smoking health. Behavior about vitamin D uses contingency coefficients. There was no significant association between vitamin D status and knowledge about smoking health. Behavior about vitamin D (p=0.685), but there was a significant relationship with vitamin D status and attitudes towards smoking health. Behaviors about vitamin D, but the association is low or weak (p=0.000). A positive attitude will reduce the risk of vitamin D deficiency which can boost the immune system during the COVID-19 pandemic.

Keywords: *Attitudes, Knowledge, Vitamin D Status*

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Introduction

Vitamin D deficiency or vitamin D deficiency can increase the incidence of respiratory diseases which occupy the top 10 chronic diseases in Indonesia. This is because vitamin D deficiency causes a decrease in lung function.[1,2,3] Low blood levels of vitamin D are associated with decreased lung function, increased inflammation, infectious or neoplastic disease. The mechanism underlying the emergence of respiratory disease due to low vitamin D levels is not clearly known, but it is suspected that vitamin D affects the function of

e-ISSN 2722-8169
p-ISSN 2723-097X

inflammatory and structural cells. Respiratory disorders also occur because they are caused by several factors such as pollution, smoking, obesity, and the socioeconomic status of the community.[4] Generally a respiratory tract disease begins with complaints and symptoms. Many studies show that vitamin D deficiency causes more susceptibility to respiratory diseases and requires a longer recovery time than patients with normal vitamin D.[5,6,7] In the liver, the vitamin D3 molecule is converted to 25-hydroxyvitamin D3 (25(OH)D3), which is the most stable and abundant vitamin D metabolite in serum, and has traditionally been used as a biomarker for individual vitamin D status. Further hydroxylation at carbon 1 yields 1α,25-dihydroxyvitamin D3 (1,25(OH)2D3), which acts as an endocrine hormone as a high-affinity ligand to the transcription factor vitamin D receptor (VDR). The main source of endocrine production of 1,25(OH)2D3 is the proximal tubular cells of the kidney, but in a paracrine or autocrine mode, monocytes, macrophages and dendritic cells of the innate immune system, osteoblasts in bone, and skin keratinocytes are also capable of producing the hormone.[8] Respiratory disorders also occur because they are caused by several factors such as pollution, smoking, obesity, and the socioeconomic status of the community. Generally a respiratory tract disease begins with complaints and mild symptoms.[9,10] Inhalation of cigarette smoke and other harmful particles causes inflammation in the respiratory tract and lungs. Indonesia is a tropical area so that people are easily exposed to sunlight which is one of the largest sources of vitamin D because vitamin D can be synthesized from the body with the help of sunlight. Sunlight is a source of vitamin D that can be found naturally and free.[11,12,13]

Although a high intake of dietary nutrients can lead to weight gain, proper and healthy nutritional intake can actually increase vitamin D levels in the blood. The intake of calcium and vitamin D can have an effect on body weight, but this still requires further research and will depend on a person's healthy lifestyle.[14,15] The measurement parameters of the vitamin D status questionnaire were quoted from previous research, which consisted of 15 questions containing sun exposure, how long to get sun exposure, protective equipment from the sun, use of sunscreen, cosmetics containing SPF, consumption of fish, eggs, milk, and vitamin D supplements, signs and symptoms of vitamin D.[15,16] The resulting data is in the form of ordinal data by categorizing vitamin D deficiency and sufficient vitamin D.[17] It is said to be vitamin D deficiency if the total value of the answers from the questionnaire is 8 and is said to be vitamin D sufficient if the total score is answers from the questionnaire >8.[18,19]

Vitamin D is an intake that needs to be met every day. This is because vitamin D plays an important role in maintaining immunity and fighting inflammation. In addition, vitamin D is able to prevent and accelerate the recovery of COVID-19 infection in asymptomatic and mild symptomatic patients. Vitamin D3 can also induce excellent antiviral immunity in the body, so it is useful in preventing and accelerating the recovery of the condition of people with COVID-19.[20,21]

This program will never be implemented properly without self-management from within each individual such as controlling thoughts, emotions, behaviour and being able to motivate oneself to achieve goals in improving one's own health.[22] With good self-management, of course, adequate knowledge and attitudes are needed in overcoming various individual health problems. Patients are empowered to make independent and responsible disease management decisions, especially when they have knowledge about their disease and can use it purposefully in making these decisions. Knowledge is multidimensional because, from the classical theory of knowledge management, knowledge includes explicit, tacit, and inactive knowledge. Thus, the field of research in public health management theory promotes patient empowerment from a patient perspective, while the field of knowledge

e-ISSN 2722-8169
p-ISSN 2723-097X

management theory provides supporting factors that stimulate the knowledge management process from an organizational perspective.[23,24] The of individuals have less knowledge and attitudes towards health problems. The relationship between knowledge and attitudes related to decreased lung function is very low due to several factors such as education level and living environment.[25,26,27] Therefore, this study aimed to determine relationship vitamin D status and knowledge-attitudes health behaviour about vitamin D.

Methods

Research design. This type of research was a cross-sectional research design. The research location used in this study was around the Surabaya area starting in March-July 2022. The research location was carried out in Rungkut Disrict, Surabaya, Indonesia.

Research variable. The variables were vitamin D status and knowledge and attitudes on smoking health behaviour about vitamin D. Vitamin D status can be defined as the presence of vitamin D in a certain amount in the body which was influenced by the intake of foods containing vitamin D, sun exposure, and consumption of vitamin D supplements. A person was said to be positive (+) (at risk) of vitamin D deficiency if the total answer score was ≥15 and negative (−) if the total answer score was <15. Vitamin D deficiency was a health problem related to vitamin D status. The variables were knowledge and attitudes on smoking health behaviour about vitamin D. Knowledge was divided into 2 groups, namely high (if the respondent answers the questionnaire with a correct value of >60% of the total knowledge questions) and low (if the respondent answers the questionnaire with a correct value of 60% of the total knowledge question). Attitudes were divided into 2 groups, namely positive and negative [19].

Population and Sample. The population of this research was active students in a private university. The sample (subject) of the study was an active student at a private university who meets the criteria: 17-30 years old, did not have a fish/milk/egg allergy disorder, did not have a special diet (vegetarian). The sampling method was purposive sampling method.

Research Methods and Analysis. Subjects who met the criteria were then asked to fill out an informed consent. The research method was by interviewing. Differences in vitamin D status and knowledge-attitudes on smoking health behaviour about vitamin D used the chi-square test. We then proceeded to test the relationship between vitamin D status and knowledge-attitudes on smoking health behaviour about vitamin D using a contingency coefficient. Ethical test No. 70/KE/IV/2022 in Universitas Surabaya.

Result and Discussion

Most of the gender in this study were male (58.62%) than female (41.38%). Most of the age range was late adolescence of 80.17%. Most of the respondents did not use drugs (53.45%) and had no history of disease (82.76%) (**Table 1**).

Table 1. Characteristics of respondents

Characteristics	Frequency (n: 116)	Percentage (%)
Gender		
Male	68	58.62
Female	48	41.38
Age (years)		
Late adolescence (17-25)	93	80.17
Early adulthood (26-35)	20	17.24
Late adulthood (36-45)	2	1.72
Early seniors (46-55)	1	0.86

Vitamin D status can be seen in **Table 2** and **Table 3**. Most of the respondents' answers said that 07.00-0.00 WIB was the time when they are generally exposed to direct sunlight (60.34%). In addition, 89 respondents (76.72%) used protective equipment from direct sunlight. Namely in the form of a jacket (44.44%) and sunblock (37.43%). The body parts protected by respondents are the face (20.27%) and hands (18.94%). Types of cosmetics used are those

e-ISSN 2722-8169
p-ISSN 2723-097X

containing UVA and UVB protection as many as 6 respondents (59.48%) (**Table 2**).

Most of the respondents had consumed fish (71.55%), but the reason most of the respondents consumed fish was because incidentally fish dishes available to eat (28.66%), followed by the answer that to get health benefits (26.83%) and liked the taste (23.78%). Respondents who consumed milk were 93 respondents (80.17%) and egg consumption were 110 respondents (94.83%). However, only a few respondents used fish oil supplements, namely only 51 respondents (43.97%), and and the reasons for taking these supplements were because they relieved symptoms of muscle pain (27.33%), improved mood (25.00%), and low back pain (23.26%) (**Table 3**).

Most of the respondents' answers regarding knowledge on smoking health behaviour about vitamin D are correct, while the questions regarding the pneumonia vaccine and HiB vaccine can help prevent COVID-19 transmission (**Table 4**). In addition, most of the respondents' attitudes were positive (**Table 5**). The results of the relationship test showed that there was no significant relationship with vitamin D status and knowledge on smoking health behaviour about vitamin D, and there was a significant relationship with vitamin D status and attitude on smoking health behaviour about vitamin D, but the relationship was low or weak (**Table 6**).

Table 2. Vitamin D Status of respondents based on Sun Exposure

Question		Frequency (n: 116)	Percentage (%)
What time do you usually get direct sunlight?	07.00-09.00 WIB	70	60.34
	10.00-11.00 WIB	32	27.59
	12.00-14.00 WIB	9	7.76
	15.00-17.00 WIB	5	4.31
Do you use protective equipment (umbrellas, hats, jackets, sunscreen, etc.) from direct sunlight?	Yes	89	76.72
	Not	27	23.28
What skin protection equipment do you use?	Umbrella	9	5.26
	Hat	22	12.87
	Jacket	76	44.44
	Sun block/ Sunscreen	64	37.43
Do you usually wear closed clothes such as long-sleeved shirts and trousers every day?	Yes	76	65.52
	Not	40	34.48
Which body part would you like to protect from direct sunlight with the protective equipment of your choice?	Face	61	20.27
	Hand	57	18.94
	Arm	55	18.27
	Foot	41	13.62
	Back and shoulders	36	11.96
	Whole body	51	16.94
	Never	0	0.00
Do you use cosmetic products (face moisturizer. hand and body cream). powder etc with SPF content?	Yes	74	63.79
	Not	37	31.90
	Don't know	5	4.31
Do the cosmetics you use contain UVA and UVB protection?	Yes	69	59.48
	Not	36	31.03
	Don't know	11	9.48

Table 3. Vitamin D Status of respondents based on Food Intake Containing Omega-3

Question		Frequency (n: 116)	Percentage (%)
Fish			
Have you consumed fish in the past week?	Yes	83	71.55
	Not	33	28.45

e-ISSN 2722-8169
p-ISSN 2723-097X

Question		Frequency (n: 116)	Percentage (%)
What is your goal in consuming fish? (the answer can be more than one)	Love the taste	39	23.78
	Get health benefits	44	26.83
	Diet to lose weight	9	5.49
	The price is cheaper/ more affordable	9	5.49
	Incidentally fish dishes available to eat	47	28.66
	other	16	9.76
Milk			
Have you consumed milk in the past week?	Yes	93	80.17
	Not	23	19.83
Egg			
Have you consumed eggs in the past week?	Yes	110	94.83
	Not	6	5.17
Fish oil Supplements			
Do you take fish oil?	Yes	8	6.90
	Not	108	93.10
How much do you consume in a day? (per teaspoon/tablespoon/capsule)	1 capsule	4	3.45
	1 capsule/week	1	0.86
	1 tablespoon	1	0.86
	2 capsules a day	1	0.86
	3 capsules a day	1	0.86
	Fresh fish	1	0.86
	No consumption	107	92.24
Do you take supplements?	Yes	51	43.97
	Not	65	56.03
Have you ever experienced this condition? (Answers can be more than one)	Muscle pain including lower back pain	47	27.33
	Pain in the pelvis. back. and feet	40	23.26
	Muscle weakness	11	6.40
	It's easy to have a bad mood or depression	43	25.00
	Low immunity, such as frequent colds in winter	31	18.02

Table 4. Knowledge on smoking health behaviour about vitamin D of respondents

Knowledge on smoking health behaviour about vitamin D	Frequency of answer (n: 116)		
	Right	Wrong	Don't know
People affected by Covid-19 will feel > 38 C. cough and shortness of breath.	108	4	4
Covering the mouth and nose with the palm of the hand when coughing or sneezing is good and correct cough etiquette.	77	36	3
People who have a higher chance of getting COVID-19 are people aged >65 years. pregnant mother. as well as people with chronic diseases.	101	8	7
People with "close contact" status are not at risk of contracting COVID-19.	17	86	13
People who are infected but don't show symptoms can't transmit it to other people.	14	92	10
Covid-19 virus spreads through the droplets of infected people.	98	2	14
Washing hands with water and soap and avoiding close contact with sick people (even if not Covid-19) are ways to protect yourself from COVID-19.	111	1	4
Pneumonia vaccine and HiB vaccine can help prevent COVID-19 transmission.	14	43	59
Antibiotics are effective in preventing and treating COVID-19.	28	58	30

e-ISSN 2722-8169
p-ISSN 2723-097X

Knowledge on smoking health behaviour about vitamin D	Frequency of answer (n: 116)		
	Right	Wrong	Don't know
People who are healthy and have no symptoms of respiratory infection still need to wear a mask because it is effective in preventing COVID-19.	97	11	8

Table 5. Attitudes on smoking health behaviour about vitamin D of respondents

Attitude on smoking health behaviour about vitamin D	Frequency of answer (n: 116)		
	Agree	Disagree	Don't know
Wearing PPE (masks) can prevent the spread of COVID-19.	108	2	6
Using personal equipment can prevent the transmission of COVID-19.	104	7	5
Hand washing can prevent the spread of COVID-19.	109	4	3
Using an antiseptic/hand sanitizer can prevent the transmission of COVID-19.	111	1	4
Avoiding excessive contact with other people can prevent the transmission of COVID-19.	102	9	5
Personal Hygiene and sanitation can prevent the transmission of COVID-19.	108	2	6
The application of social distancing can break the chain of COVID-19.	106	6	4

Table 6. Relationship Vitamin D status and knowledge-attitude on smoking health behaviour about vitamin D of respondents

Knowledge-attitude on smoking health behaviour about vitamin D of respondents		Vitamin D status (n: 116)		TOTAL	Correlationtest
		Deficiency	Non deficiency		
Knowledge	High	6	6	12	p=0.685
	Enough	48	23	71	Conclusion: There was no significant relationship with vitamin D status and knowledge on smoking health behaviour about vitamin D
	Low	13	20	33	
Attitude	Positive	52	22	74	(p=0.000) KK= 0.345
	Negative	15	27	42	Conclusion: There was a significant relationship with vitamin D status and attitude on smoking health behaviour about vitamin D, but the relationship was low or weak
TOTAL		**67**	**49**		

Vitamin D is one of the essential nutrients to sustain the human health. The largest source of vitamin D is derived from sunlight. The main source of vitamin D is cutaneous synthesis. The contribution from food sources is less prominent because foods containing vitamin D are generally not part of most daily diet patterns.[12] Sunlight contains ultraviolet B (UVB) rays which can convert 7-dehydrocholesterol (pro vitamin D3) in the skin into cholecalciferol (vitamin D3). Sunlight can produce vitamin D in the skin 80-90% of total vitamin D, the rest can be produced from foods such as seafood, shrimp, mushrooms, egg yolks and milk as much as 10-20% and the use of vitamin D supplements.[12,19]

Sunlight can be harmful and can be harmless. Sunlight is harmful to the skin because it can cause skin cancer, while sunlight is not harmful to the skin because it can help produce vitamin D in the skin.[16]

e-ISSN 2722-8169
p-ISSN 2723-097X

Exposure to Ultraviolet B (UVB) for a long time can cause various side effects such as skin cancer, erythema pigmentation and so on. Because of this side effect, many people avoid exposure to sunlight, resulting in a deficiency of vitamin D3. Ultraviolet A (UVA) rays can cause skin damage to last longer, because they can penetrate the skin deeper than UVB rays and affect the DNA of cells in the dermis, attacking cell membranes and changing the proteins that make up collagen and elastin, which support the skin's fibrous structure. This can cause the skin to become loose and wrinkled. UVA rays also play a role in the development of skin cancer.[28,29]

People who are often exposed to the sun such as field workers (outdoors) have an increased risk of skin cancer compared to those who usually spend a lot of time indoors, this is because they spend hours in direct sunlight, wearing protective clothing. limited skin, and the effect of sunscreen is reduced in the presence of sweat. Older workers scored higher sun protection behaviours at work and leisure, a well-known association with outdoor workers. Among young people, especially men, there is a tendency to report less risk-averse behaviour and a higher ability to cope with risk, which may explain why younger workers protect themselves less. Additionally, there is a strong association with older age and decreased belief that tanned skin is more attractive, and indeed age is negatively correlated with reporting of employed tanneries. Workers were less likely to wear hats and shirts on weekends, indicating that safety requirements for construction workers led to higher occupational sun protection behaviour scores. An Australian study showed that outdoor workers who were required to wear sun protection had less sun-damaged skin than those who could voluntarily use available sun protection at work. While sun protection is not the motivation behind having workers wear hats and shirts at work, it may provide sun protection as an unintended consequence.[30,31]

A good time to be exposed to sunlight is from 10.00 WIB to 14.00 WIB. there are differences in the optimum time and duration of sunbathing to meet the needs of vitamin D. It can be concluded that the best time of sunbathing to increase vitamin D in preventing COVID 19 is between 09.00-10.00, maximum 15 minutes or until skin starts to turn red 2-3 times per week. It is recommended to keep wearing a hat and sunscreen to protect the head and neck area,[32] because at that time UVB rays are more than UVA, if above 14.00 WIB the amount of UVA increases so that there is an increase in the amount of sunlight that damages the skin. The length of exposure depends on the skin type. The more pigmented the skin, the longer the synthesis of vitamin D in the skin. Asians tend to have skin types III to V.[33]

The darker the skin color, the greater the amount of melanin in the epidermis of the skin. Melanin can compete with 7-dehydrocholesterol for UVB absorption, so people with dark skin are less efficient at producing vitamin D in the skin, or take a longer time than people with skin types I or II.[34,35] People with skin types I to III take 15 minutes to produce vitamin D in the skin, while people with skin types V/VI take up to 2 hours to produce vitamin D, while according to Qureshi et al.[32] the length of time required by the body to be exposed to direct sunlight in order to obtain vitamin D is 15-30 minutes.

Sunscreen with SPF 8 reduces the production of previtamin D3 by 95% and SPF 15 by 99%,[16,36] That a good sunscreen for the body to prevent skin cancer is a sunscreen that contains SPF 15. The use of products that contain SPF should be when you want to do outdoor activities for a long time. Protecting the body from sun damage is as good as using personal protection against sun exposure, such as sunscreen with SPF > 15 from 10.00 WIB to 16.00 WIB,[37] but by paying attention to the adequacy of daily vitamin D. The need for vitamin D for adult children is 400-1000 IU.[38]

There are several factors that affect a person's knowledge, namely: education, mass media, and socio-cultural and economic.

e-ISSN 2722-8169
p-ISSN 2723-097X

Education is an effort to develop personality and abilities inside and outside school and lasts a lifetime.[39] Mass media/information sources, as a means of communication, various forms of mass media such as television, radio, newspapers, magazines, internet, and others have a major influence on the formation of people's opinions and beliefs.[40,41] Socio-cultural and economic, habits and traditions that are carried out by people without going through reasoning whether what is done is good or bad.[42] The environment is everything that is around the individual, both the physical, biological, and social environment.[43]

Conclusion

There was no significant relationship with vitamin D status and knowledge on smoking health behaviour about vitamin D, but there was a significant relationship with vitamin D status and attitude on smoking health behaviour about vitamin D, but the relationship was low or weak.

Acknowledgement

This research was funded by Institute of Research and Community Service by Universitas Surabaya.

Author contribution

All authors contributed to the design, writing, and edition of the manuscript. Data extraction was performed by CFS, AL, and RVS. AL performed the data analysis. All authors read and approved the final version of the manuscript

Conflict of Interest

There was no conflict of interest in this research.

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Knowledge-Attitude Health Behaviour And Vitamin D Status During Epidemic Covid-19

PDF (https://comphi.sinergis.org/comphi/article/view/233/158)

Published: Mar 2, 2025

Keywords:
attitude, knowledge, vitamin D status

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Abstract

Vitamin D deficiency or vitamin D deficiency can increase the incidence of respiratory diseases. The of individuals have less knowledge and attitudes towards health problems. The objective was determine relationship vitamin D status and knowledge-attitudes health Behaviour about vitamin D. This type of research was a cross-sectional research design. The research location used in this study was around the Surabaya area starting in March-July 2022. The research location was carried out in Rungkut District, Surabaya, Indonesia. The variables were vitamin D status and knowledge and attitudes on smoking health Behaviour about vitamin D. The relationship between vitamin D status and knowledge-attitudes on smoking health Behaviour about vitamin D using a contingency coefficient. There was no significant relationship with vitamin D status and knowledge on smoking health Behaviour about vitamin D (p=0.685), but there was a significant relationship with vitamin D status and attitude on smoking health Behaviour about vitamin D, but the relationship was low or weak (p=0.000). A positive attitude will reduce the risk of vitamin D deficiency which can boost the immune system during the COVID-19 pandemic.

How to Cite

Lorensia, A., Septinellya, C. F. ., & Suryadinata, R. V. . (2025). Knowledge-Attitude Health Behaviour And Vitamin D Status During Epidemic Covid-19. *CoMPHI Journal: Community Medicine and Public Health of Indonesia Journal*, *5*(3), 236-246. Retrieved from https://comphi.sinergis.org/comphi/article/view/233

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Vol. 5 No. 3 (2025): Februari (In Progress)

DOI: https://doi.org/10.37148/comphijournal.v5i3 (https://doi.org/10.37148/comphijournal.v5i3)

Published: 2025-02-28

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by Amelia Lorensia

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KNOWLEDGE-ATTITUDE HEALTH BEHAVIOUR AND VITAMIN D STATUS DURING EPIDEMIC COVID-19

[1]Amelia Lorensia, [2]Cinthya Farah Septinellya, [3]Rivan Virlando Suryadinata

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ABSTRAK

Defisiensi vitamin D atau kekurangan vitamin D dapat meningkatkan kejadian penyakit pernafasan. Masyarakat kurang memiliki pengetahuan dan sikap terhadap masalah kesehatan. Tujuan penelitian ini adalah untuk mengetahui hubungan status vitamin D dengan pengetahuan-sikap perilaku kesehatan tentang vitamin D. Jenis penelitian yang digunakan adalah desain penelitian cross-sectional. Lokasi penelitian yang digunakan dalam penelitian ini adalah di sekitar wilayah Surabaya mulai bulan Maret-Juli 2022. Lokasi penelitian dilakukan di Kecamatan Rungkut, Surabaya, Indonesia. Variabel yang digunakan adalah status vitamin D dan pengetahuan serta sikap terhadap kesehatan merokok. Perilaku tentang vitamin D. Hubungan antara status vitamin D dengan pengetahuan dan sikap terhadap kesehatan merokok. Perilaku tentang vitamin D menggunakan koefisien kontingensi. Tidak terdapat hubungan yang signifikan antara status vitamin D dengan pengetahuan tentang kesehatan merokok. Perilaku tentang vitamin D (p=0.685), namun terdapat hubungan yang signifikan dengan status vitamin D dan sikap terhadap kesehatan merokok. Perilaku tentang vitamin D, namun hubungannya rendah atau lemah (p=0,000). Sikap positif akan mengurangi risiko kekurangan vitamin D yang dapat meningkatkan sistem kekebalan tubuh di masa pandemi COVID-19.

Kata kunci: *Sikap, Pengetahuan, Status Vitamin D*

ABSTRACT

Vitamin D deficiency or vitamin D deficiency can increase the incidence of respiratory diseases. The community lacks knowledge and attitude towards health problems. The purpose of this study is to determine the relationship between vitamin D status and knowledge of health behaviors about vitamin D. The type of research used is a cross-sectional research design. The research location used in this study is around the Surabaya area from March-July 2022. The location of the research was carried out in Rungkut District, Surabaya, Indonesia. The variables used were vitamin D status and knowledge and attitudes towards smoking health. Behavior about vitamin D. The relationship between vitamin D status and knowledge and attitudes towards smoking health. Behavior about vitamin D uses contingency coefficients. There was no significant association between vitamin D status and knowledge about smoking health. Behavior about vitamin D (p=0.685), but there was a significant relationship with vitamin D status and attitudes towards smoking health. Behaviors about vitamin D, but the association is low or weak (p=0.000). A positive attitude will reduce the risk of vitamin D deficiency which can boost the immune system during the COVID-19 pandemic.

Keywords: *Attitudes, Knowledge, Vitamin D Status*

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Introduction

Vitamin D deficiency or vitamin D deficiency can increase the incidence of respiratory diseases which occupy the top 10 chronic diseases in Indonesia. This is because vitamin D deficiency causes a decrease in lung function.[1,2,3] Low blood levels of vitamin D are associated with decreased lung function, increased inflammation, infectious or neoplastic disease. The mechanism underlying the emergence of respiratory disease due to low vitamin D levels is not clearly known, but it is suspected that vitamin D affects the function of

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inflammatory and structural cells. Respiratory disorders also occur because they are caused by several factors such as pollution, smoking, obesity, and the socioeconomic status of the community.[4] Generally a respiratory tract disease begins with complaints and symptoms. Many studies show that vitamin D deficiency causes more susceptibility to respiratory diseases and requires a longer recovery time than patients with normal vitamin D.[5,6,7] In the liver, the vitamin D3 molecule is converted to 25-hydroxyvitamin D3 (25(OH)D3), which is the most stable and abundant vitamin D metabolite in serum, and has traditionally been used as a biomarker for individual vitamin D status. Further hydroxylation at carbon 1 yields 1α,25-dihydroxyvitamin D3 (1,25(OH)2D3), which acts as an endocrine hormone as a high-affinity ligand to the transcription factor vitamin D receptor (VDR). The main source of endocrine production of 1,25(OH)2D3 is the proximal tubular cells of the kidney, but in a paracrine or autocrine mode, monocytes, macrophages and dendritic cells of the innate immune system, osteoblasts in bone, and skin keratinocytes are also capable of producing the hormone.[8] Respiratory disorders also occur because they are caused by several factors such as pollution, smoking, obesity, and the socioeconomic status of the community. Generally a respiratory tract disease begins with complaints and mild symptoms.[9,10] Inhalation of cigarette smoke and other harmful particles causes inflammation in the respiratory tract and lungs. Indonesia is a tropical area so that people are easily exposed to sunlight which is one of the largest sources of vitamin D because vitamin D can be synthesized from the body with the help of sunlight. Sunlight is a source of vitamin D that can be found naturally and free.[11,12,13]

Although a high intake of dietary nutrients can lead to weight gain, proper and healthy nutritional intake can actually increase vitamin D levels in the blood. The intake of calcium and vitamin D can have an effect on body weight, but this still requires further research and will depend on a person's healthy lifestyle.[14,15] The measurement parameters of the vitamin D status questionnaire were quoted from previous research, which consisted of 15 questions containing sun exposure, how long to get sun exposure, protective equipment from the sun, use of sunscreen, cosmetics containing SPF, consumption of fish, eggs, milk, and vitamin D supplements, signs and symptoms of vitamin D.[15,16] The resulting data is in the form of ordinal data by categorizing vitamin D deficiency and sufficient vitamin D.[17] It is said to be vitamin D deficiency if the total value of the answers from the questionnaire is 8 and is said to be vitamin D sufficient if the total score is answers from the questionnaire >8.[18,19]

Vitamin D is an intake that needs to be met every day. This is because vitamin D plays an important role in maintaining immunity and fighting inflammation. In addition, vitamin D is able to prevent and accelerate the recovery of COVID-19 infection in asymptomatic and mild symptomatic patients. Vitamin D3 can also induce excellent antiviral immunity in the body, so it is useful in preventing and accelerating the recovery of the condition of people with COVID-19.[20,21]

This program will never be implemented properly without self-management from within each individual such as controlling thoughts, emotions, behaviour and being able to motivate oneself to achieve goals in improving one's own health.[22] With good self-management, of course, adequate knowledge and attitudes are needed in overcoming various individual health problems. Patients are empowered to make independent and responsible disease management decisions, especially when they have knowledge about their disease and can use it purposefully in making these decisions. Knowledge is multidimensional because, from the classical theory of knowledge management, knowledge includes explicit, tacit, and inactive knowledge. Thus, the field of research in public health management theory promotes patient empowerment from a patient perspective, while the field of knowledge

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management theory provides supporting factors that stimulate the knowledge management process from an organizational perspective.[23,24] The of individuals have less knowledge and attitudes towards health problems. The relationship between knowledge and attitudes related to decreased lung function is very low due to several factors such as education level and living environment.[25,26,27] Therefore, this study aimed to determine relationship vitamin D status and knowledge-attitudes health behaviour about vitamin D.

Methods

Research design. This type of research was a cross-sectional research design. The research location used in this study was around the Surabaya area starting in March-July 2022. The research location was carried out in Rungkut Disrict, Surabaya, Indonesia.

Research variable. The variables were vitamin D status and knowledge and attitudes on smoking health behaviour about vitamin D. Vitamin D status can be defined as the presence of vitamin D in a certain amount in the body which was influenced by the intake of foods containing vitamin D, sun exposure, and consumption of vitamin D supplements. A person was said to be positive (+) (at risk) of vitamin D deficiency if the total answer score was ≥15 and negative (−) if the total answer score was <15. Vitamin D deficiency was health problem related to vitamin D status. The variables were knowledge and attitudes on smoking health behaviour about vitamin D. Knowledge was divided into 2 groups, namely high (if the respondent answers the questionnaire with a correct value of >60% of the total knowledge questions) and low (if the respondent answers the questionnaire with a correct value of 60% of the total knowledge question). Attitudes were divided into 2 groups, namely positive and negative [19].

Population and Sample. The population of this research was active students in a private university. The sample (subject) of the study was an active student at a private university who meets the criteria: 17-30 years old, did not have a fish/milk/egg allergy disorder, did not have a special diet (vegetarian). The sampling method was purposive sampling method.

Research Methods and Analysis. Subjects who met the criteria were then asked to fill out an informed consent. The research method was by interviewing. Differences in vitamin D status and knowledge-attitudes on smoking health behaviour about vitamin D used the chi-square test. We then proceeded to test the relationship between vitamin D status and knowledge-attitudes on smoking health behaviour about vitamin D using a contingency coefficient. Ethical test No. 70/KE/IV/2022 in Universitas Surabaya.

Result and Discussion

Most of the gender in this study were male (58.62%) than female (41.38%). Most of the age range was late adolescence of 80.17%. Most of the respondents did not use drugs (53.45%) and had no history of disease (82.76%) (**Table 1**).

Table 1. Characteristics of respondents

Characteristics	Frequency (n: 116)	Percentage (%)
Gender		
Male	68	58.62
Female	48	41.38
Age (years)		
Late adolescence (17-25)	93	80.17
Early adulthood (26-35)	20	17.24
Late adulthood (36-45)	2	1.72
Early seniors (46-55)	1	0.86

Vitamin D status can be seen in **Table 2** and **Table 3**. Most of the respondents' answers said that 07.00-0.00 WIB was the time when they are generally exposed to direct sunlight (60.34%). In addition, 89 respondents (76.72%) used protective equipment from direct sunlight. Namely in the form of a jacket (44.44%) and sunblock (37.43%). The body parts protected by respondents are the face (20.27%) and hands (18.94%). Types of cosmetics used are those

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containing UVA and UVB protection as many as 6 respondents (59.48%) (**Table 2**).

Most of the respondents had consumed fish (71.55%), but the reason most of the respondents consumed fish was because incidentally fish dishes available to eat (28.66%), followed by the answer that to get health benefits (26.83%) and liked the taste (23.78%). Respondents who consumed milk were 93 respondents (80.17%) and egg consumption were 110 respondents (94.83%). However, only a few respondents used fish oil supplements, namely only 51 respondents (43.97%), and and the reasons for taking these supplements were because they relieved symptoms of muscle pain (27.33%), improved mood (25.00%), and low back pain (23.26%) (**Table 3**).

Most of the respondents' answers regarding knowledge on smoking health behaviour about vitamin D are correct, while the questions regarding the pneumonia vaccine and HiB vaccine can help prevent COVID-19 transmission (**Table 4**). In addition, most of the respondents' attitudes were positive (**Table 5**). The results of the relationship test showed that there was no significant relationship with vitamin D status and knowledge on smoking health behaviour about vitamin D, and there was a significant relationship with vitamin D status and attitude on smoking health behaviour about vitamin D, but the relationship was low or weak (**Table 6**).

Table 2. Vitamin D Status of respondents based on Sun Exposure

Question		Frequency (n: 116)	Percentage (%)
What time do you usually get direct sunlight?	07.00-09.00 WIB	70	60.34
	10.00-11.00 WIB	32	27.59
	12.00-14.00 WIB	9	7.76
	15.00-17.00 WIB	5	4.31
Do you use protective equipment (umbrellas, hats, jackets, sunscreen, etc.) from direct sunlight?	Yes	89	76.72
	Not	27	23.28
What skin protection equipment do you use?	Umbrella	9	5.26
	Hat	22	12.87
	Jacket	76	44.44
	Sun block/ Sunscreen	64	37.43
Do you usually wear closed clothes such as long-sleeved shirts and trousers every day?	Yes	76	65.52
	Not	40	34.48
Which body part would you like to protect from direct sunlight with the protective equipment of your choice?	Face	61	20.27
	Hand	57	18.94
	Arm	55	18.27
	Foot	41	13.62
	Back and shoulders	36	11.96
	Whole body	51	16.94
	Never	0	0.00
Do you use cosmetic products (face moisturizer. hand and body cream). powder etc with SPF content?	Yes	74	63.79
	Not	37	31.90
	Don't know	5	4.31
Do the cosmetics you use contain UVA and UVB protection?	Yes	69	59.48
	Not	36	31.03
	Don't know	11	9.48

Table 3. Vitamin D Status of respondents based on Food Intake Containing Omega-3

Question		Frequency (n: 116)	Percentage (%)
Fish			
Have you consumed fish in the past week?	Yes	83	71.55
	Not	33	28.45

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Question		Frequency (n: 116)	Percentage (%)
What is your goal in consuming fish? (the answer can be more than one)	Love the taste	39	23.78
	Get health benefits	44	26.83
	Diet to lose weight	9	5.49
	The price is cheaper/ more affordable	9	5.49
	Incidentally fish dishes available to eat	47	28.66
	other	16	9.76
Milk			
Have you consumed milk in the past week?	Yes	93	80.17
	Not	23	19.83
Egg			
Have you consumed eggs in the past week?	Yes	110	94.83
	Not	6	5.17
Fish oil Supplements			
Do you take fish oil?	Yes	8	6.90
	Not	108	93.10
How much do you consume in a day? (per teaspoon/tablespoon/capsule)	1 capsule	4	3.45
	1 capsule/week	1	0.86
	1 tablespoon	1	0.86
	2 capsules a day	1	0.86
	3 capsules a day	1	0.86
	Fresh fish	1	0.86
	No consumption	107	92.24
Do you take supplements?	Yes	51	43.97
	Not	65	56.03
Have you ever experienced this condition? (Answers can be more than one)	Muscle pain including lower back pain	47	27.33
	Pain in the pelvis. back. and feet	40	23.26
	Muscle weakness	11	6.40
	It's easy to have a bad mood or depression	43	25.00
	Low immunity, such as frequent colds in winter	31	18.02

Table 4. Knowledge on smoking health behaviour about vitamin D of respondents

Knowledge on smoking health behaviour about vitamin D	Frequency of answer (n: 116)		
	Right	Wrong	Don't know
People affected by Covid-19 will feel > 38 C. cough and shortness of breath.	108	4	4
Covering the mouth and nose with the palm of the hand when coughing or sneezing is good and correct cough etiquette.	77	36	3
People who have a higher chance of getting COVID-19 are people aged >65 years. pregnant mother. as well as people with chronic diseases.	101	8	7
People with "close contact" status are not at risk of contracting COVID-19.	17	86	13
People who are infected but don't show symptoms can't transmit it to other people.	14	92	10
Covid-19 virus spreads through the droplets of infected people.	98	2	14
Washing hands with water and soap and avoiding close contact with sick people (even if not Covid-19) are ways to protect yourself from COVID-19.	111	1	4
Pneumonia vaccine and HiB vaccine can help prevent COVID-19 transmission.	14	43	59
Antibiotics are effective in preventing and treating COVID-19.	28	58	30

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Knowledge on smoking health behaviour about vitamin D	Frequency of answer (n: 116)		
	Right	Wrong	Don't know
People who are healthy and have no symptoms of respiratory infection still need to wear a mask because it is effective in preventing COVID-19.	97	11	8

Table 5. Attitudes on smoking health behaviour about vitamin D of respondents

Attitude on smoking health behaviour about vitamin D	Frequency of answer (n: 116)		
	Agree	Disagree	Don't know
Wearing PPE (masks) can prevent the spread of COVID-19.	108	2	6
Using personal equipment can prevent the transmission of COVID-19.	104	7	5
Hand washing can prevent the spread of COVID-19.	109	4	3
Using an antiseptic/hand sanitizer can prevent the transmission of COVID-19.	111	1	4
Avoiding excessive contact with other people can prevent the transmission of COVID-19.	102	9	5
Personal Hygiene and sanitation can prevent the transmission of COVID-19.	108	2	6
The application of social distancing can break the chain of COVID-19.	106	6	4

Table 6. Relationship Vitamin D status and knowledge-attitude on smoking health behaviour about vitamin D of respondents

Knowledge-attitude on smoking health behaviour about vitamin D of respondents		Vitamin D status (n: 116)		TOTAL	Correlationtest
		Deficiency	Non deficiency		
Knowledge	High	6	6	12	p=0.685
	Enough	48	23	71	Conclusion: There was no significant relationship with vitamin D status and knowledge on smoking health behaviour about vitamin D
	Low	13	20	33	
Attitude	Positive	52	22	74	(p=0.000) KK= 0.345
	Negative	15	27	42	Conclusion: There was a significant relationship with vitamin D status and attitude on smoking health behaviour about vitamin D, but the relationship was low or weak
TOTAL		**67**	**49**		

Vitamin D is one of the essential nutrients to sustain the human health. The largest source of vitamin D is derived from sunlight. The main source of vitamin D is cutaneous synthesis. The contribution from food sources is less prominent because foods containing vitamin D are generally not part of most daily diet patterns.[12] Sunlight contains ultraviolet B (UVB) rays which can convert 7-dehydrocholesterol (pro vitamin D3) in the skin into cholecalciferol (vitamin D3). Sunlight can produce vitamin D in the skin 80-90% of total vitamin D, the rest can be produced from foods such as seafood, shrimp, mushrooms, egg yolks and milk as much as 10-20% and the use of vitamin D supplements.[12,19]

Sunlight can be harmful and can be harmless. Sunlight is harmful to the skin because it can cause skin cancer, while sunlight is not harmful to the skin because it can help produce vitamin D in the skin.[16]

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Exposure to Ultraviolet B (UVB) for a long time can cause various side effects such as skin cancer, erythema pigmentation and so on. Because of this side effect, many people avoid exposure to sunlight, resulting in a deficiency of vitamin D3. Ultraviolet A (UVA) rays can cause skin damage to last longer, because they can penetrate the skin deeper than UVB rays and affect the DNA of cells in the dermis, attacking cell membranes and changing the proteins that make up collagen and elastin, which support the skin's fibrous structure. This can cause the skin to become loose and wrinkled. UVA rays also play a role in the development of skin cancer.[28,29]

People who are often exposed to the sun such as field workers (outdoors) have an increased risk of skin cancer compared to those who usually spend a lot of time indoors, this is because they spend hours in direct sunlight, wearing protective clothing. limited skin, and the effect of sunscreen is reduced in the presence of sweat. Older workers scored higher sun protection behaviours at work and leisure, a well-known association with outdoor workers. Among young people, especially men, there is a tendency to report less risk-averse behaviour and a higher ability to cope with risk, which may explain why younger workers protect themselves less. Additionally, there is a strong association with older age and decreased belief that tanned skin is more attractive, and indeed age is negatively correlated with reporting of employed tanneries. Workers were less likely to wear hats and shirts on weekends, indicating that safety requirements for construction workers led to higher occupational sun protection behaviour scores. An Australian study showed that outdoor workers who were required to wear sun protection had less sun-damaged skin than those who could voluntarily use available sun protection at work. While sun protection is not the motivation behind having workers wear hats and shirts at work, it may provide sun protection as an unintended consequence.[30,31]

A good time to be exposed to sunlight is from 10.00 WIB to 14.00 WIB. there are differences in the optimum time and duration of sunbathing to meet the needs of vitamin D. It can be concluded that the best time of sunbathing to increase vitamin D in preventing COVID 19 is between 09.00-10.00, maximum 15 minutes or until skin starts to turn red 2-3 times per week. It is recommended to keep wearing a hat and sunscreen to protect the head and neck area,[32] because at that time UVB rays are more than UVA, if above 14.00 WIB the amount of UVA increases so that there is an increase in the amount of sunlight that damages the skin. The length of exposure depends on the skin type. The more pigmented the skin, the longer the synthesis of vitamin D in the skin. Asians tend to have skin types III to V.[33]

The darker the skin color, the greater the amount of melanin in the epidermis of the skin. Melanin can compete with 7-dehydrocholesterol for UVB absorption, so people with dark skin are less efficient at producing vitamin D in the skin, or take a longer time than people with skin types I or II.[34,35] People with skin types I to III take 15 minutes to produce vitamin D in the skin, while people with skin types V/VI take up to 2 hours to produce vitamin D, while according to Qureshi et al.[32] the length of time required by the body to be exposed to direct sunlight in order to obtain vitamin D is 15-30 minutes.

Sunscreen with SPF 8 reduces the production of previtamin D3 by 95% and SPF 15 by 99%,[16,36] That a good sunscreen for the body to prevent skin cancer is a sunscreen that contains SPF 15. The use of products that contain SPF should be when you want to do outdoor activities for a long time. Protecting the body from sun damage is as good as using personal protection against sun exposure, such as sunscreen with SPF > 15 from 10.00 WIB to 16.00 WIB,[37] but by paying attention to the adequacy of daily vitamin D. The need for vitamin D for adult children is 400-1000 IU.[38]

There are several factors that affect a person's knowledge, namely: education, mass media, and socio-cultural and economic.

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Education is an effort to develop personality and abilities inside and outside school and lasts a lifetime.[39] Mass media/information sources, as a means of communication, various forms of mass media such as television, radio, newspapers, magazines, internet, and others have a major influence on the formation of people's opinions and beliefs.[40,41] Socio-cultural and economic, habits and traditions that are carried out by people without going through reasoning whether what is done is good or bad.[42] The environment is everything that is around the individual, both the physical, biological, and social environment.[43]

Conclusion

There was no significant relationship with vitamin D status and knowledge on smoking health behaviour about vitamin D, but there was a significant relationship with vitamin D status and attitude on smoking health behaviour about vitamin D, but the relationship was low or weak.

Acknowledgement

This research was funded by Institute of Research and Community Service by Universitas Surabaya.

Author contribution

All authors contributed to the design, writing, and edition of the manuscript. Data extraction was performed by CFS, AL, and RVS. AL performed the data analysis. All authors read and approved the final version of the manuscript

Conflict of Interest

There was no conflict of interest in this research.

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