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Analysis Of Vitamin D Levels in The Population Infected with Covid-19

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A B S T R A C T

The global pandemic of covid-19 is a problem faced by all nations in the world and until now there has not been found a drug that is truly capable of killing the covid-19 virus. Yet the death toll continues to fall around the world. Until the middle of August 2022, more than 150 thousand people have died from this disease in Indonesia (https://covid19.go.id). The vaccination program also has not reached 70%, therefore one alternative way that can be done by the society is to avoid being exposed to the covid-19 by implementing health protocols and maintaining/ increasing body resistance. Recently, there have been studies reporting that there is a relationship between vitamin D levels in the blood and the immune system. This study aims to analyze the relationship between vitamin D levels in the blood and a history of being infected with COVID 19. This was an analytical survey study with a cross-sectional approach that tries to examine the relationship between blood vitamin D/25(OH)D3 levels, vaccine completeness status, adherence to the 5M health protocol, age and gender with a history of being infected with COVID-19. The population in this study was all lecturers at Malahayati University Bandar Lampung, totaling 303 people, while the sample was 62 Malahayati University lecturers who were willing to be samples. The sampling technique used was non-probability sampling: consecutive sampling. The collected data were analyzed using logistic regression. The results showed that there was a relationship between adherence to health protocols (pValue: 0.007) with OR 6.48 (95% CI: 1.67 – 15.4) and vitamin D levels in the blood (pValue: 0.045) with OR 3.13 (CI95%: 1.02 – 9.59). The more disobedient to the procedure and the lower the level of vitamin D in the blood, can impact the greater the potential for infection with COVID-19. There is a need for continuous education to remind the importance of implementing health protocols and the need to increase the intake of vitamin D either from food or from pro-vitamin D biosynthesis in the skin with ultraviolet B/UVB.

Kata kunci:

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INTRODUCTION

In the end of 2019, the world was faced with the problem of the global pandemic of covid-19 disease, and until now it has not ended. The disease, which is caused by the SAR-CoV-2 virus, continues to mutate until new variants appear, such as the Omicron variant which is currently hitting Indonesia. The death toll continues to fall throughout the world, including in Indonesia, until mid-2022 a total of 150 thousand people died throughout Indonesia (https://covid19.go.id).

It is known that until now, not all Indonesians have received a complete covid-19 vaccination. There is also no effective medicine for this disease, so the alternative way that can be done by the society is to avoid being exposed to the covid-19 virus by applying the 5 M, maintaining distance, washing hands with soap, always wearing masks, avoiding crowds and reducing unnecessary mobility. Another way that is also effective in preventing illness is to maintain or increase body resistance (Hermawan, 2021); (Farmawati, Ula, & Qomariyah, 2021).

Based on theory, there are many ways that can be used to maintain or increase endurance, such as increasing the consumption of nutritious foods, consuming multi vitamins, avoiding stress, getting enough rest, exercising regularly and avoiding pollution, including avoiding exposure to cigarette smoke. The immune system is also influenced by many things, such as age, occupation, nutritional status, pregnancy and others (Yogani, Karyadi, Uyainah, & Koesnoe, 2017).

Recently, there have been studies reporting that there is a positive relationship between vitamin D levels in the blood and the immune system, although the exact mechanism still raises many questions. In general, we know that vitamin D plays an important role in regulating the mineralization of bones and teeth, as well as preventing various degenerative diseases such as: cancer, heart disease, hypertension, obesity, diabetes mellitus and others. (Hermawan, 2021; Manousaki & Richards, 2017; Maruotti & Cantatore, 2010; Sigmund, 2002; Vanlint, 2013). Many important functions of vitamin D have been reported, but currently, the problem of vitamin D deficiency in the blood is a problem reported worldwide, then it has been declared as a pandemic. (Michael F. Holick, 2010).

Even though the results of the latest research report that vitamin D is able to prevent infection with covid-19 (Ali, 2020). The study results also reported that sun exposure was proven to improve the healing of patients with covid-19 (Asyary & Veruswati, 2020). Exposure to sunlight, especially ultraviolet B/UVB is necessary for the biosynthesis of vitamin D in the skin (Hall, 2015).

Vitamin D, whether derived from biosynthesis in the skin from exposure to UVB rays or from food, is reported to have many effects on the immune system, including being able to increase the work of macrophages, neutrophils, activate T lymphocytes, all of them will activate the immune system. So that the immune system will be more prepared/stronger when there is a virus or antigen that enters the body (Prietl, Treiber, Pieber, & Amrein, 2013). The results of this study are also reinforced by research that reports that the administration of vitamin D plays an important role in activating the immune system in patients with covid-19, both in pediatric patients and in adult patients. (Panfili et al., 2021).

Information about the importance of vitamin D to prevent this covid-19 disease, has spread widely to the society, so many people are basking in the morning sun in the hope of getting additional vitamin D to avoid various diseases, including avoiding covid-19. Even though this research still needs to be deepened to answer the question, if it is true that vitamin D plays a role in increasing the body's resistance/immune system, Indonesian people who are located in tropical countries can be more resistant to infectious diseases compared to other people living in sub-tropical countries/regions. But in reality, if we look at the increase in the number of covid-19 cases, it seems that there is no difference, because all countries report the incidence of this disease which is still increasing. This condition attracts the author, to examine further the correlation between vitamin D levels in the blood and the immune system. This study aims to analyze the relationship between vitamin D levels and morbidity from covid-19.

RESEARCH METHOD

Research Design and Subject

This study was an analytical observational study with a cross-sectional approach that analyzed the relationship between vitamin D levels in the blood and the morbidity of covid-19 patients. This research was carried out from March to July 2022 in the integrated laboratory of Malahayati University, while the measurement of vitamin D levels in the

blood was carried out at the Prodia clinical laboratory in Bandar Lampung. This research has obtained a research ethics permit from the Health Research Ethics Commission, Malahayati University Bandar Lampung with No: 2499/EC/KEP-UNMAL/V/2022 dated 20 May 2022.

The population of this study was all lecturers at Malahayati University, totaling 303 people. Due to the difficulty of obtaining samples that are willing to be taken and examined for blood in this study, the researchers used a sampling technique: non-probability sampling: consecutive sampling. The sample in this study was the lecturers of Malahayati University, Bandar Lampung who were willing and voluntarily to be the sample in the study totaling 62 lecturers.

Data collection and measurement

Variable blood levels of 25(OH)D_3 were measured by the Direct competitive chemiluminescence immunoassay (CLIA) method using the Liaison 25-OH Vitamin D total reagent produced by DiaSorin Liaison with catalog number 310600 which is able to detect levels of 25(OH)D_3 between 4 and 150 ng/mL. Subjects were taken as much as 5 cc of blood in the morning, who had fasted / did not eat at night. Then the blood sample was centrifuged at a speed of 1300-2000 g for 15 minutes, then separated the serum and put it into the apparatus for examination at the Prodia Clinical Laboratory, Lampung Province.

In this study, data related to several variables such as having been infected with covid-19 or not, implementation of health protocols, number of covid-19 vaccinations and other variables such as age and gender were also recorded. All of these variables were obtained by direct interviews with research subjects.

Data analytics

The data of this study were analyzed to see if there was a relationship between vitamin D levels in the blood and whether or not they had been infected with covid-19, completeness of the covid-19 vaccine, implementation of health protocols, age, gender and occupation were analyzed using the chi square test and continued with logistic regression with the SPSS program version 25.

RESULTS AND DISCUSSION

Table 1
Results of univariate analysis

Variable	Freq	%
History of being infected with Covid-19		
No	15	24,2 %
Yes/Ever	47	75,8 %
Gender:		
Male	21	34 %
Female	41	66 %
Age:		
Low Risk (under 45 years)	46	74 %
High Risk (45 years old and above)	16	26 %
Blood Vitamin D levels:		
Normal (above 30 – 100 ng/mL)	1	1,6 %
Sufficient (above 20 – 30 ng/mL)	10	16,1%
Less (between 10 – 20 ng/mL)	38	61,2%
Very Poor (below 10 ng/mL)	13	20,9%
Completeness of Covid-19 Vaccine:		
Complete (2 times or more)	46	74 %
Incomplete (less than 2 times)	16	26 %
Adherence to Health Protocols:		
Obedient	25	40%
Disobedient	37	60 %

From table 1, it appears that most of the research samples (75.8%) have suffered from covid-19. The female gender became the most sampled in this study, which was 41 people or 66%. Meanwhile, in terms of age, most of them are in the risky age category, which is above 45 years (74%).

It is also found that there are only 1.6% of samples with normal blood vitamin D levels, while the rest are sufficient (16.1%), 61.2% less and there are even 13 samples (20.9%) samples that have have very low levels of vitamin D (below 10 ng/mL). This reinforces the notion that even though we are in the tropics, we still experience a lack of vitamin D levels in the blood. Changes in behavior to avoid sunlight and lack of intake of foods containing vitamin D are suspected to be the cause.

It is also known that there are still 26% of the samples that have not been completed (at least 2 times) doing the covid-19 vaccine and there are 60% of the samples who do not comply with the health protocol.

Table 2. Results of bivariate analysis

Variable	History of being infected with Covid-19		P Value	OR/CI 95%
	No	Yes		
Gender:				
Male	8	13	0,067	
Female	7	34		
Age:				
Low Risk (under 45 years)	10	36	0,444	
High Risk (45 years old and above)	5	11		
Blood Vitamin D levels:				
Normal (above 30 – 100 ng/mL)	1		0,04	
Sufficient (above 20 – 30 ng/mL)	3	7		
Less (between 10 – 20 ng/mL)	11	27		
Very Poor (below 10 ng/mL)	0	13		
Completeness of Covid-19 Vaccine:				
Complete (2 times or more)	14	32	0,05	6,5
Incomplete (less than 2 times)	1	15		0,788 – 54,64
Adherence to Health Protocols:				
Obedient	11	14	0,003	6,48
Disobedient	4	33		1,78 – 23,8

From table 2, gender is not associated with a history of being infected with covid-19 (pValue: 0.067). This shows that both men and women have the same potential for suffering from covid-19. This result is different from previous research which concluded that more men were infected with covid-19, because smoking behavior and drinking habits that many men do can increase the risk of contracting covid-19 (Abate, Kassie, Kassaw, Aragie, & Masresha, 2020). This difference occurs presumably, because the population of this study is lecturers who are mostly health lecturers who do not smoke and do not drink alcohol, so that the risk is the same between men and women in this study.

Age is also not related to a history of being infected with covid-19 (pValue: 0.44). This shows that both the high-risk age (above 45 years) and the low-risk age (under 45 years) have the same potential to suffer from covid-19. Previous research has reported that age affects the severity of suffering from covid-19(Statsenko et al., 2022). Older covid-19 patients tend to experience more severe/severe symptoms when compared to younger patients. The difference in results occurred in this study, because in this study, we did not experience the severity level but only looked at whether or not they had been infected with covid-19. The result is that both old and young people have the same potential to be infected with covid-19.

Meanwhile, vitamin D levels in the blood were associated with a history of infection with covid-19 (pValue: 0.04). This result shows that there is a significant relationship between vitamin D levels in the blood and whether or not they have been infected with covid-19. From table 2, it is also added that most of those who suffer from covid-19 have low levels of vitamin D (10-20 ng/mL), which is 27 samples. Vitamin D is believed to have an effect on the immune system, vitamin D is able to modulate the innate immune system and also the adaptive immune system (Bui, Zhu, Hawkins, Cortez-Resendiz, & Bellon, 2021; Chirumbolo, Bjørklund, Sboarina, & Vella, 2017; Panfili et al., 2021), although there are still many studies that report that there is not enough evidence to state that vitamin D is able to prevent covid-19 infection (Ali, 2020).

Table 2 also states that the completeness of the covid vaccine is significantly related to the incidence of covid-19 infection (pValue: 0.05), with an OR value of 6.5. These results show that the completeness of the covid-19 vaccine has the potential to prevent infection with covid-19 as much as 6.5 times when compared to those who are not vaccinated or who are not fully vaccinated. The covid-19 vaccine has proven to be effective in preventing infection with covid-19, and is even effective for patients who are recovering from covid-19 infection. The results show that vaccination during recovery from covid-19 is very effective in preventing re-infection (Bui et al., 2021). Various efforts have been made by the Government to increase the number of covid-19 vaccine coverage, ranging from socialization, education to a "door to door" vaccination program by involving various institutions. However, until the end of August 2022, only 72% have received the second dose of vaccine and only 25% of the Indonesian population has received the third dose (ttps://vaksin.kemkes.go.id), there are still many people who have not received the covid-19 vaccine because they are unwilling/reluctant and afraid to be vaccinated.

Adherence to health protocol is also a variable associated with a history of being infected with covid-19. The results of the statistical test showed pValue: 0.003 with an OR value of 6.48. These results show that adhering to health protocol is able to reduce 6.48 times the risk of being infected with covid-19 when compared to nonadherence. Adherence to the health protocols has proven to be able to prevent potential exposure to the covid-19 virus. Many studies have reported this (Bui et al., 2021), but unfortunately adherence to current health protocols, seems to have declined. The results showed a decrease in adherence was more visible in the community group that had been vaccinated (Bui et al., 2021), the perception of having had immunity after being vaccinated caused adherence to the procedure to decrease. In this study, it also appears that only 25% are obedient with health protocols, while the rest are no longer compliant. Most of the nonadherence to this procedure is avoiding crowds and eating/drinking together, while the health protocol adherence that is still mostly done is washing hands with soap and wearing masks.

Table 3. Results of Multivariate Analysis.

Variable	B	Wald	Sig	OR	CI (95%)
Vitamin D levels	1,144	4,022	0,045	3,13	1,02 – 9,59
Ad**herence to health protocol**	1,869	7,164	0,007	6,48	1,64 – 15,4

The results of the multivariate test showed that the variable levels of vitamin D in the blood and adherence to health protocol were the most dominant variables associated with a history of being infected with covid-19. The adherence variable is the variable with the largest OR value, which is 6.48. This is possible because by complying with the procedures, the possibility of the body being exposed to the virus that causes covid-19 is smaller, so it is more likely to be able to avoid the disease covid-19. Maintaining adherence to health protocols will be better to be able to prevent our bodies from being exposed to covid-19 (Fakih, Oktaviana, Nurlaili, Febrianto, & Nargis, 2022), so a process is needed to be able to remind again of the importance of using masks when outside the home, washing hands with soap, reducing unnecessary mobility, avoiding crowds and avoiding eating/drinking together which causes us to open masks when in public spaces. Education about the importance of a sustainable process needs to continue to be given to the society (Sulistyowati, Yani, Christyanni, Agus, & Nusantoro, 2021), although it seems that there is a decrease in the number of covid-19 cases. The awareness that prevention will be easier and cheaper than cure must also be reminded to the society, so that they return to adhere to health protocols.

Awareness of the society about the importance of maintaining vitamin D intake also needs to be well socialized, because the results of the multivariate test show that vitamin D is also a variable that also influences the possibility of being infected with covid-19. Intake of foods/drinks that contain lots of vitamin D, such as fish, fish oil, eggs and milk (Statsenko et al., 2022) and outdoor activity patterns need to be optimized so that blood levels of vitamin D are within normal ranges (De Rui et al., 2014). Outdoor activities must continue to be encouraged to

optimize UVB exposure so that the vitamin D biosynthesis process in the skin runs well (Hall, 2015) and can avoid several diseases known to be associated with low levels of vitamin D in the blood (Hermawan & Hidayat, 2022; Hermawan, Muhani, & Arisandi, 2022; Hermawan & Widodo, 2021).

The limitation in this study is the limited number of samples, this is because very few research subjects are willing to fast overnight and their blood is taken in the morning to check their vitamin D levels, so the researchers used consecutive sampling techniques, by taking as much data as possible on subjects who were willing to take part in research procedure.

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CONCLUSIONS DAN RECOMMENDATIONS

Adherence to health protocols and low blood levels of vitamin D were significantly associated with a history of being infected with covid-19. The more nonadherence to health protocols and the lower levels of vitamin D in the blood, the more a person's potential to be infected with covid-19 will increase.

It is necessary to continue to maintain society adherence to the health protocols by continuing to carry out ongoing education to the community. Efforts are also needed to increase vitamin D levels in the blood, either by increasing the consumption of foods containing vitamin D or by optimizing UVB exposure so that the biosynthesis of vitamin D in the skin goes well. Although the results of the multivariate analysis of vaccine completeness are not the dominant variable, the covid-19 vaccination program must also continue to be encouraged in order to increase the number of covid-19 vaccination coverage, especially for the second dose and booster dose.

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