Psychiatric Health as The Dominant Factor of Covid-19 Symptom

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Keywords:
Binary logistic regression, Covid symptoms, Dominant factor, Psychiatric condition.

ABSTRACT

Strictly implementing health protocols have been campaigned continuously during the Covid-19 pandemic. However, the number of positive cases of Covid-19 keeps growing and reaches even more than thousands of cases per day. This study aims to determine the dominant factor of the Covid-19 symptom using a binary logistic regression model. This is a cross-sectional study using 415 respondents from the productive age population in Yogyakarta. The data collected was Covid-19 symptoms experienced by respondents in the last 14 days and 8 variables sourced from the health protocol and the Depression Anxiety Stress Scale. The instrument used was an online questionnaire. Data was collected for 1 month, which was at the beginning of the outbreak (March-April 2020). The data obtained were analyzed by Binary Logistic Regression. The results showed that the dominant factors for the Covid-19 symptom were psychiatric health condition affected the mild symptom shifting to severe symptom, but the handwashing activities and the body immune did not affect the shifting. If people with mild symptoms have severe psychiatric health conditions, they would have a 9 times risk shift into severe Covid-19 symptoms. and if people with mild symptoms have mild psychiatric health conditions, they will have 5 times the risk of shifting into severe Covid-19 symptoms. In conclusion, the dominant factors that affect the occurrence of the mild symptom shifting to severe symptom were psychiatric health conditions and the risk factor was 5-9 times. People had to pay more attention to keeping psychiatric health conditions so that they would not shift into severe symptoms.
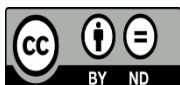
1. INTRODUCTION

The new coronavirus first appeared in Wuhan City, Hubei Province, China on January 30, 2020. The new virus was named Covid-19 (Corona Virus 2019) by world virus experts and WHO. The nature of Covid-19 is similar to the MERS and SARS viruses. Although the percentage is low to cause death which is 2% compared to MERS (35%), SARS (10%), the transmission power is 20 times higher than the previous viruses

[1], [2]. This was shown by the rapid number of countries affected by Covid-19, the addition of new cases, and the increase in deaths in various countries. The number of countries affected by Covid-19 is 25 countries (February 16, 2020) and in a short time, hit in 216 countries (October 11,2020). The number of cases in October 11, 2020 is 37.588.732. The increasing number of the new case per day is 150.503 The deaths is 1.078.985 or 2.87%, and the recovered number is 28.188.199 [3]. America is the first country that has high number of Covid19 case. In this case, Indonesia is the 21th of the 216 countries. The number of cases in October 11, 2020 is 333.449. The increasing number of the new case per day is 4.497. The death is 11.844 (3.55%) and the number of recovered is 255.027. In this case, Jakarta special province is first province that has highest number of case and Yogyakarta special region is the 8th of the 36 provinces in Indonesia. On June 27, 2021 data, there was 57.858 Covid-19 cases with 71.74% hospitalized, 26.62% recovered and 1.64% deaths in Yogyakarta [4]. The transmission of Covid-19 virus is a spreading by droplet infection. The incubation periods is 14 days. The high number of new cases added shows that there is still a process of transmission in the community. The transmission is likely to come from people who are at low risk, those who have been in contact with other people under monitoring, and those who are at high risk, namely people who have contact with sufferers under surveillance. The government has attracted it by 3Ts, namely Trace, Test, and Treatment. In the other side, it also does mass campaign in applying health standard protocol. It calls 3 M, namely using mask, washing hand, and keeping distancing. Government also give recommendation to increase immunity and to avoid getting stress, depression and anxiety.

Not all people can be monitored by health service facilities. The limitations of the rapid test kit facility in Indonesia encourage the government to determine the criteria for citizens who get the rapid test service [5]. On the other hand, it is estimated that there are several residents at risk of Covid-19 that do not detected by rapid tests and they are still there in the community. They may feel mild symptoms of Covid-19. If they get rapid test service, the results may appear the reactive one. The assumption developed is that if the community pay more attention to the dominant factor, the mild Covid-19 symptoms would not become worse. The objective of this research is to determine the dominant factors of Covid-19 symptom using binary logistic regression model.

2. Methods
The research design was a cross-sectional survey, which was carried out in the Special Region of Yogyakarta for 1 month (March - April 2020). This research has got ethical approval from our Institutional Ethic Board No. e-KEPK/POLKESYO/0324/III/2020. Respondents were the productive age group based on WHO namely > 19 to 64 years [6], [7] as many as 415 people calculated using Slovin formula [8]. This age group has high mobility and is at risk for Covid-19. The independent variable measured was the recommended standard of termination of the Covid-19 transmission frequency consisting of 8 variables. These variables are area restrictions, outside activities, frequency of washing hand with soap daily, frequency of using hand-sanitizers daily, frequency of disinfecting homes and the environment daily, use of mask, psychiatric conditions (depression, anxiety, stress), and efforts to increase body immune. The dominant factor here is the variable that has more effect compared to other standard variables. Data collection used a questionnaire which was compiled based on the guidelines of the Ministry of Health of the Republic of Indonesia [2] and DASS [9] and distributed online. The dependent variable is the Covid-19 symptom experienced by respondents in the last 14 days before filling out the form. Covid-19 Symptoms are 8 conditions of covid symptoms experienced by respondents in the last 14 days. The eight symptoms of Covid-19 measured are fever, sneezing, cough, runny nose, headache, sore throat, lethargy, and breathing difficulties. Each symptom is given a score of 1 if experienced "more than usual"; 2 if "often", and 3 if "never". Covid-19's symptoms are mild if they have 20-24 score and severe symptoms if they have 16-19 score. The collected data were analyzed using Binary Logistic Regression, preceded by selection of independent variables using Chi-square statistical

analysis for variables with categorical scales and t-tests for variables with numerical scales. If the p-value of the independent variable shows a value> 0.25, then the variable is declared failed and is not included in the Binary logistic regression analysis, and vice versa. Binary logistic regression analysis is intended to obtain variables that significantly affect the dependent variable (p-value <0.1). The analysis is carried out in stages by removing the variables that have a p-value> 0.1 one at a time, starting from the variable that has the highest p-value, and then running it again to get a variable that has a p-value <0.1.

3. Result

The largest percentage of respondents (N=415) were male (69.4%), the average age was 29.5+11.3 years (20-69); education varied from junior high school (0.2%) to PhD (2.4%), mostly Senior High school graduates (41.7%); occupation varied among others Government employee (31.1%), housewives (1.7%) and students (39.3%), while they came from 5 districts, most of them from Sleman districts (46.3%), the average body temperature is 37.09 oC +0.58oC (34 oC-38oC). Figure.1 provides this information in detail.

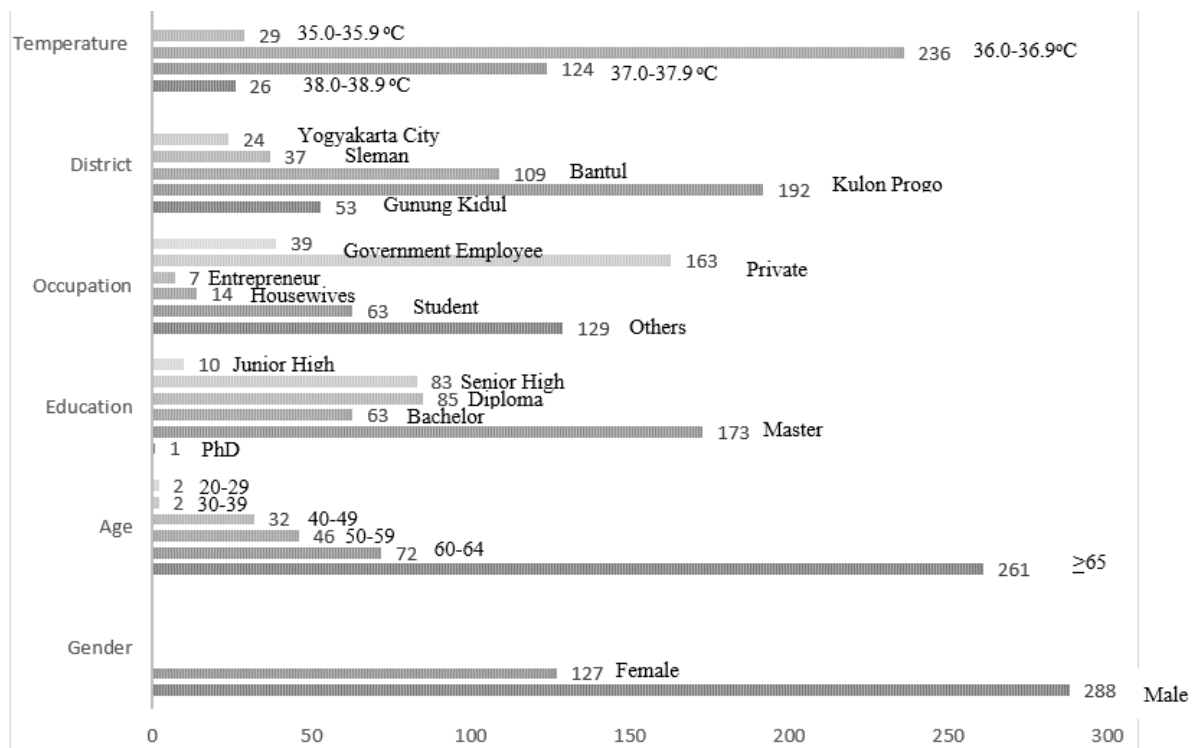**Figure 1.** Characteristic of Respondents (N=415)

The Covid-19 symptom level experienced by respondents in the last 14 days was mild symptoms (20-24) in 83.6% and severe (16-19) in 16.4%. The level of Covid-19 symptoms is a combination of all the symptoms of Covid-19, which are fever, sneezing, cough, runny nose, headache, sore throat, lethargy, and breathing difficulties. Figure 2 provides information in detail.
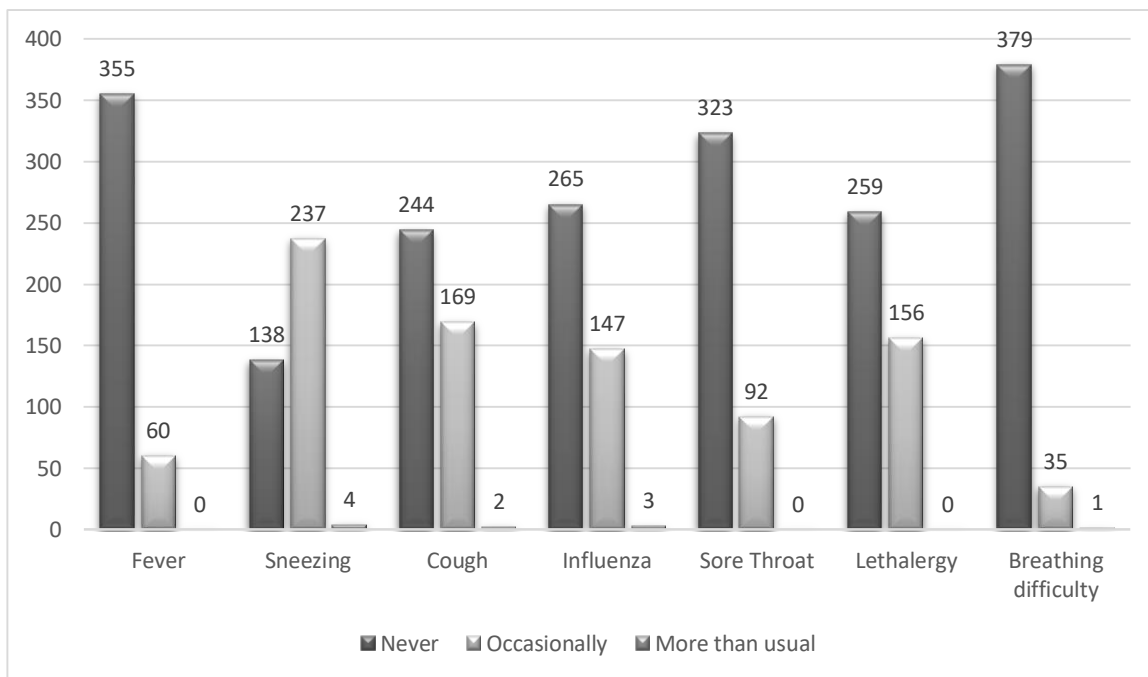
Figure 2. Respondents' Symptoms (N=415)

Most respondents stated that there are restrictions in their area, and they carry out activities outside the home. They use masks, do disinfects an average of 10 times daily, use hand sanitizers an average of 4 times daily, and disinfect homes and the environment an average of 2 times daily. Their psychiatric condition is in the moderate and severe categories and the level of efforts to improve body immune is in the moderate and good categories. Complete results can be seen in the following Tables 1 and 2.

Table 1. Independents categorical variables assumed to affect the severity of the Covid-19's symptom (N=415)

Categorical Variables		Frequency	%
Area Restriction			
	No	125	30.1
	Yes	290	69.9
Outdoor activity			
	Yes	319	76.9
	No	96	23.1
Using mask			
	Never	6	1.4
	1 occasion	198	47.7
	2 occasions	211	50.8
Depression			
	Normal (0-9)	400	96.4
	Mild (10-13)	9	2.2
	Moderate (14-20)	3	0.7
	Severe (21-27)	3	0.7
	Extremly severe (≥28)	0	0
Anxiety			
	Normal (0-7)	387	93.7
	Mild (8-9)	8	1.9
	Moderate (10-14)	11	2.7
	Severe (15-19)	4	1.0

	Extremly severe (≥20)	3	0.7
Stress			
	Normal (0-14)	398	95.9
	Mild (15-18)	17	4.1
	Moderate (19-25)	0	0
	Severe (26-33)	0	0
	extremely severe (≥34)	0	0
Psychiatric Condition (Combination of Depression, anxiety, and stress):			
	Mild (0-15)	359	86.5
	Moderate (16-31)	47	11.3
	Severe (33-48)	9	2.2
Anxiety toward Covid19:			
	Never	11	2.7
	Neutral	100	24.1
	Worried	304	65.1
	Severely worried	34	8.2
Consuming fruits and vegetables			
	Never	2	0.5
	Sometimes	123	29.6
	Often	290	69.9
Drinking water:			
	Never	1	0.2
	Sometimes	30	7.2
	Often	384	92.5
Exercising:			
	Never	56	13.5
	Sometimes	286	68.9
	Often	73	17.6
Taking a rest:			
	Less	19	4.6
	Moderate	133	32
	Enough	263	63.4
Smoking:			
	Often	5	1.2
	Sometimes	8	1.9
	Never	402	96.9
Sunbathing:			
	Never	30	7.2
	Sometimes	255	61.4
	Often	130	31.3
Consuming supplement:			
	Never	72	17.3
	Sometimes	236	56.9
	Often	107	25.8
Immunity level (Combination of all efforts):			
	Less (0-4)	0	0
	Moderate (5-9)	107	25.8
	Good (10-14)	308	74.2

Table 2. Independents numerical variables assumed to affect the severity of the Covid-19's symptom

Numerical Variables	Mean	Standard Deviation	Min-max

Washing hands with soap daily	9.97	5.2	2-40
Hand sanitizer usage daily	3.52	3.5	0-20
Disinfecting house and environment daily	1.63	1.2	0-10

We select the variables to prepare Binary Logistic Model using Chi-Square and T-test. Chi-Square is used to analyze the categorical variables and T-test is used to analyze the numerical variables. The result of the two analysis showed the home outside activities variable, the frequency of using hand sanitizers, and the disinfection of the house and its environment had significance level more than 0.25. So, the three variables are not followed in the Binary Logistic Regression Model. Table 3 provides the information in detail.

Table 3. The Results of Preparing in using the Binary Logistic Regression Model

Variable	Level of Significancy[a]	Level of Significancy[b]	Description
Social Distancing	0.247		
Home Outside Activity	1.00*		Not be included in the Binary Logistic Regression model
Depression	0.097		
Anxiety	0.000		
Stress	0.002		
Level of psychiatric health	0.000		
Level of the body immune	0.015		
Mask usage	0.219		
Washing hands daily		0.017	
Hand sanitizer usage daily		0.303*	Not be included in the Binary Logistic Regression model
Disinfecting house and environment daily		0.488*	Not be included in the Binary Logistic Regression model

.[a] Chi-square test, [b] T-test

In stage 1 of Binary Logistic Regression Analysis, there are only 2 variables that showed the level of significant <0.1, namely the frequency of washing hand using water and soap and increased body immune. The other variables have level of significant > 0.1 and the highest is the anxiety level variable. For this reason, the anxiety level variable is excluded from the Regression analysis model and then run again.

In stage 2 of Binary Logistic Regression Analysis, there are 3 variables that showed the level of significant <0.1, namely level of the psychiatric health condition (1); the frequency of washing hand using water and soap and increased body immune. The other variables have level of significant > 0.1 and the highest is Level of depression. For this reason, the Level of depression variable is excluded from the Regression analysis model and then run again.

In stage 3 of Binary Logistic Regression Analysis, there are there are 3 variables that showed the level of significant <0.1, namely level of the psychiatric health condition especially point (1); the frequency of washing hand using water and soap; and increased body immune. The other variables have level of significant > 0.1 and the highest is Mask usage. For this reason, the mask usage variable is excluded from the Regression analysis model and then run again.

In stage 4 of Binary Logistic Regression Analysis, there are 3 variables that showed the level of significant

<0.1, namely level of the psychiatric health condition point (1) and point (2); the frequency of washing hand using water and soap and increased body immune. The other variables have level of significant > 0.1 and the highest is level of stress. For this reason, the level of stress variable is excluded from the Regression analysis model and then run again.

In stage 5 of Binary Logistic Regression Analysis, there are 3 variables that showed the level of significant <0.1, namely level of the psychiatric health condition point (1) and point (2); the frequency of washing hand using water and soap and increased body immune. The other variables have level of significant > 0.1 and the highest is social distancing. For this reason, social distancing variable is excluded from the Regression analysis model and then run again.

In stage 6 of Binary Logistic Regression Analysis, all the variables showed the level of significant <0.1, there are level of the psychiatric health condition point (1) and point (2); the frequency of washing hand using water and soap and increased body immune. There is no variable have level of significant >0.1. For this reason, the Regression analysis model did not run again. The result of the Regression analysis model can be showed on the Table 4.

Table 4. The result of the Regression analysis model

Variables		Betha	S Eror	Wald	Df	Sig	Exp (B)
1	Level of psychiatric health			10.884	2	0.004	
	Psychiatric health severe level (1)	2.265	0.736	9.476	1	0.002	9.634
	Psychiatric health mild level (2)	1.694	0.796	4.533	1	0.033	5.440
2	Hand washing using water and soap	-0.060	0.296	4.188	1	0.041	0.545
3	Level of body immune	-0.606	0.024	6.466	1	0.011	0.942
	Constanta	0.333	0.784	0.181	1	0.671	1.396

Table 4 showed these three variables are stated as variables that significantly affect the dependent variable, namely changes in Covid symptoms from mild to severe. They are the level of psychiatric health, the hand washing using water and soap, and the level of body immune. Among those 3 variables, the severe level of psychiatric health especially is the biggest, because it's has 9.634 score of the exponent B. So, we determine it as the dominant factor to control the covid 19 symptom moving from mild to severe one.

If someone with the mild symptom of Covid 19 and she or he has severe psychiatric health condition, she or he might has risk 9.922 times shift to severe symptom compare to someone hasn't it. If someone with the mild symptom of Covid 19 and she or he has mild psychiatric health condition, she or he might has risk 5.340 times shift to severe symptoms compare to someone hasn't it. If someone with the mild symptom of Covid 19, and she or he does hand washing using water and soap frequently, she or he might hasn't risk shifting to severe symptom, because the score of exponent B not more than 1. If someone with the mild symptom of Covid 19, and she or he has body immunity, she or he might hasn't risk shifting to severe symptom, because the score of exponent B not more than 1.

The 6th stage binary logistic regression analysis produces the following regression line of equation:
Y=0.333+2.265 X1+1.694X2-0.060X3-0.606X4
With   X1=Severe Psychiatric Health Condition

X2=Mild Psychiatric Health Condition

X3= Frequency of hand washing using water and soap

X4= Level of effort to increase body immune

This equation states fixed because all of the number of significant are less than 0.05. The Equation line showed the psychiatric health condition effected the mild symptom shift to severe symptom, but the hand washing activities and the body immune effort did not effect the mild sympthom shift to severe symptom. The magnitude of the chances for the 3 variables on the dependent variable can be calculated using formula:

$$\text{Chances} = \frac{1}{1 + Exp^{-(0.333+2.265+1.694-0.060-0.606)}}$$

$$= \frac{1}{1 + Exp^{-(3.626)}}$$

$$= 97.4\%$$

This equation shows high prediction, because the magnitude of chances is 97.4%

4. Discussion

Psychiatric condition had a dominant factor in moving the mild symptom to severe symptom. Even a healthy person can experience psychiatric disorders if exposed to various interfering threats. Covid-19 can cause a person experience stress because it is limited in carrying out activities such as going to the school, to the office, to the mall, or to the market and to entertainment places. Prolonged stress can cause someone experience anxiety disorders and even depression. Stress causes physiological changes in the body that weaken the immune system, and ultimately affect health so it is susceptible to disease, and the emergence of immune system disorders with the appearance of psoriasis and eczema. When stress occurs, glucocorticoid hormones and cortisol (stress hormone) trigger anti-inflammatory reactions in the immune system [10]. What is about people in monitoring or patients under surveillance of Covid-19? When the rapid tests result or PCR confirmed positive then anxiety disorders will increase, even to the level of severe or panic [11], [12]. The Covid-19 pandemic has alarming implications for individual and community health as well as emotional and social functioning. In addition to providing medical care, health service providers who have developed have an important role in monitoring psychosocial needs and providing psychosocial support to patients, health care providers, and public activities that must be integrated into general pandemic health care [13], [14].

The frequency of washing hands with soap is a variable that affects the occurrence of mild to severe symptoms of Covid19. If this habit is carried out properly, it will reduce the possibility of a shift from mild to severe of Covid symptoms. The results of the study showed an average of 9.97 times daily of this habit. In an epidemiological study in Stockholm Sweden in 3,091 adolescents, 28.7% was reported doing a wash less than 10 times per day and only 3.1% did it less than 20 times per day. Besides, studies in Stockholm state that washing hands for a long time will irritate the skin [15] and changes in skin texture [16]. A survey in Hubei China reported that 71% of 330 healthcare workers assisted at the Covid 19 clinic since Covid 19 spread in China in December 2019, feeling that damage to the layers of the skin had included itching due to frequent washings and the long use of personal protective equipment [17]. There is a consensus for every health worker to comply with the "two before and three after" procedures. The standard operating procedure requires health workers to do 2-time washings before handling the patient as an effort to prevent (invasive procedure) and wash hands after handling patients and touching objects that may be contaminated [17]. Standardizing the use of disinfectants for hand hygiene and recommended skincare after washing is important for caring hands [17]. In addition, hand care using a moisturizer after washing and the use of a portable hand-sanitizer can prevent the spread of abnormalities on the hands skin [16]. The lowest use of hand sanitizer results in skin

irritation compared to the use of chlorine solution and the use of soap and water, after subjects were intervened to do it 10 times per day for 28 days (18). Each method has advantages and disadvantages. The use of soap is widely accepted and inexpensive, but requires water and does not inactivate the virus [18]. Handwashing with non-antibacterial soap is much more effective in removing bacteria from hands than handwashing with water only [19], but in 2009, soap and water were declared to be used to treat H1N1 influenza virus [20].

In this study, respondents in Yogyakarta had done a 9.97 times average disinfection, it was stated that it could inhibit the shift of mild to severe viral symptoms. This is reasonable because for health workers who are daily dealing with Covid patients (in Wuhan when the Covid pandemic 19), must comply with "2 times before and 2 times after treating patients". The frequency is lower than the average frequency that has been done by research subjects. Therefore, it can be assured that the frequency of washing with 9.97 times a day can prevent the occurrence of severe Covid symptoms. Adequacy of nutrients, especially vitamins (A, D, C, E, B6, and B12), and minerals (selenium, folate, iron, and zinc) are needed in maintaining an optimal immune system. Most vitamins and minerals can not be synthesized by the body, so the consumption of diverse and balanced foods is very important especially the source of mineral vitamins such as fruits and vegetables. Some vitamins and minerals have a role as antioxidants and anti-inflammatory to increase body immune [21], [22]. Drinking large amounts of water will help the production of saliva and fluids in body organs such as the mouth, nose, and eyes which are needed to prevent port the entree of bacteria, parasites, and feces that cause infection. Also, water has the function of helping the production of lymph to circulate white blood cells and other immune system cells from the thymus and bone marrow throughout the body. In summary, the body needs water to produce lymph. Without lymph, white blood cells and other immune cells will not be able to pass throughout the body to fight disease [21], [22].

The immune system increases when we sleep and take a rest. When we sleep, T cells are reduced from the bloodstream so the risk of infection is low. T cells are a type of white blood cell and are the basis of the body's immune system. T cells are in the bloodstream and ready to attack viruses and other pathogens that attack the body. Even during the restful resting phase, the body can release T cells, growth hormones, and return epinephrine to the circulation to fight pathogens when needed [23]. Sports and non-smoking behavior are efforts to increase endurance that will prevent the occurrence of mild to severe Covid symptoms. Regular exercise can strengthen the immune system by stimulating the performance of white blood cells, which are a major component of the body's resistance to blood circulation [24]. Smoking can damage physical barriers, such as the mucosa, which keeps harmful substances from the outside. Substances contained in cigarette smoke can also reduce the transformation of T lymphocytes as a marker of decreased cellular endurance system. Components of cigarettes weaken the immune system, making smokers have the risk of having a lung infection [25- 27]. Vitamin D has an immunomodulatory effect that can improve the body's immune system. The main source of natural vitamin D comes from ultraviolet (UV) sunlight. Sunbathing will be exposed to ultraviolet (UV) rays which are beneficial in the formation of vitamin D3 which functions to metabolize bones and improve the immune system. Sun exposure changes pro-vitamin D3 from the 7-dehydrocholesterol precursor compound into vitamin D3. Blue light in the sun also has a significant impact on the activation of T cells, which are one of the cells playing a role in the immune system [28].

Among food supplements that can be used to boost the immune system and reduce the severity of coronavirus infections include vitamin C, vitamin E, and zinc (Zn). Vitamin C is a powerful antioxidant, anti-inflammatory, and a co-factor for biosynthesis and gene regulating enzymes. Vitamin C contributes to the defense of the immune system by supporting various cellular functions, both the innate immune system and adaptive immunity [29], [30]. Vitamin E is an antioxidant that protects cells and tissues from gradual damage due to excessive oxidation (free radicals) and can increase white blood cell production, especially

lymphocytes [31]. Zinc takes control of the activation of immune cells that fight infection. Zinc deficiency in plasma can inhibit the formation of T cells, which in turn decreases humoral and cellular immunity and atrophy in the thymus, lymphopenia, and subsequently, failure can occur in fighting infection in the form of microbes or viruses [32]. Zinc deficiency also causes decreased natural killer cell activity, CD4 + and CD8 +, decreases lymphocyte proliferation activity, and inhibits antibody formation by B cells [33]. Zinc deficiency also causes decreased natural killer cell activity, CD4 + and CD8 +, decreases lymphocyte proliferation activity, and inhibits antibody formation by B cells.

The implication of the results of this study is the need for health literacy efforts for the community in a professional collaboration in controlling the symptoms of Covid-19 in various health care facilities. Nurses emphasize efforts to control the psychiatric condition of the community. Sanitation staff emphasize the importance of washing with soap with a frequency less than 10 times daily. Nutritionists emphasize the importance of increasing immune.

5. Conclusion

The dominant factors controlling Covid-19's symptoms are psychiatric conditions, frequency of washing hand with soap, and increased body immune. These 3 factors are the dominant factors that provide a great opportunity to prevent the incidents of the Covid-19 symptoms from mild to severe if observed more than any other standard factor.

The community needs to pay more attention to these 3 dominant factors besides other factors in the health protocol. For future researchers, research on the consistency of community behavior in implementing stringent health protocols in welcoming a new normal era is needed.

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