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Nutritional Knowledge in Improving Immunity through Healthy Eating Habits during the Covid-19 Pandemic

Pengetahuan Terkait Gizi dalam Upaya Meningkatkan Imunitas melalui Kebiasaan Makan selama Pandemi Covid-19

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ABSTRACT

Background: The spread of COVID-19 in Indonesia has caused many deaths. One of the ways to deal with COVID-19 is to increase immunity. Youth is the majority population group in the world, meaning many can potentially be exposed to the coronavirus. Youth, including students, tend to be easily exposed to the coronavirus because they have bad eating habits (lack of protein, vitamin C, and vitamin A intake). Bad eating habits can occur due to a lack of knowledge related to nutrition, especially those related to efforts to increase immunity.
Objectives: To determine the relationship between nutrition-related knowledge to increase body immunity with eating food sources of protein, vitamin A, and vitamin C during the covid-19 pandemic in Airlangga University students.
Methods: Descriptive quantitative method used a cross-sectional research design with a sample of Airlangga University students. The data was obtained using an online survey using the accidental sampling method. Furthermore, the researcher distributed online questionnaires in the form of google forms with the help of media such as pamphlets through social media. Then the data were analyzed using the Chi-square test.
Results: Most of the respondents were students of the Faculty of Public Health, female, 21 years old, and living with their nuclear family at home during the Covid-19 pandemic, have good knowledge of nutrition to increase immunity (75%), except for factors which can reduce immunity. There is a significant positive relationship between knowledge and eating habits.
Conclusions: There was a significant relationship between knowledge related to nutrition to increase immunity during the covid-19 pandemic through eating food sources of protein, vitamin A, and vitamin C.

INTRODUCTION

At the beginning of 2020, the coronavirus (Covid-19) pandemic spread worldwide and in Indonesia. Coronavirus (CoV) is a virus that can be a cause of illness that starts with the flu to severe disease Middle East Respiratory Syndrome (MERS-CoV) and Severe Acute Respiratory Syndrome-2 (SARS-CoV-2)[1]. When looking at the age trend in which young people now dominate, students are at risk of exposure to severe pathogens and infections. To overcome the spread of Covid-19, an individual must carry out a preventive movement by practicing a healthy lifestyle, such as implementing health protocols by always wearing a mask, washing hands, and maintaining distance to avoid transmitting the virus. Not only that, an individual must maintain a healthy immune system, and this method is one of the best ways to prevent the spread of the Covid-19 virus[1]. Health education about Covid-19 and nutrition related to increasing body immunity contributes to understanding how to prevent Covid-19. An individual's education can make them absorb information and knowledge easily so that nutritional status will be achieved, even health status and the body's immune system will be better. The immune system is a complex and efficient defense system consisting of an integrated collection of cells, chemical mediators, and a series of defensive "modular" factors to modulate the immune response and protect the body from external invaders[1-2].

Nutrition is one of the most critical factors affecting the body's immune system. Good nutrition is a significant determinant in preventing and treating acute and chronic diseases[2]. Based on data from previous studies, it was found that there is an increase in global consumption of diets high in saturated fat and refined carbohydrates, which can contribute to the prevalence of chronic diseases[3]. This finding places a group at a higher

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risk of contracting Covid-19. Unhealthy eating habits are also mentioned that can affect the immune system, which then causes chronic inflammation and can damage the body's defense mechanism against viruses[4].

Consumption pattern habits are the composition of the type and amount of food consumed by an individual in a certain time[5]. Healthy eating habits are eating habits that are carried out to maintain health and nutritional status and prevent or help the healing process of certain diseases[6]. Good eating habits are essential, especially during the Covid-19 pandemic, to prevent Covid-19. In forming white blood cells, protein has a critical role. The body can recognize which pathogens must be killed and cleaned from the body so that the body is not infected with a disease, with sufficient protein intake. When Covid-19 infects a person, the need for protein increases so that the body's immune response increases and can kill more viruses or bacteria.

Meanwhile, the protein intake recommended by the Indonesian RDA for adult women aged 19-29 is 60 g/day, while for adult men aged 19-29 is 90 g/day. Vitamin A mainly protects the cell structure of the respiratory tract in maintaining the body's immunity when there is a virus infection. Vitamin A guards against attacks and helps make antibodies that neutralize disease-causing pathogens. Meanwhile, Vitamin C can increase the body's immunity through the innate immune response mechanism by activating macrophages and neutrophils (phagocytosis). In addition, it is also stated that vitamin C can increase antibody levels by increasing the work of T and B lymphocytes. Covid-19 cause lower respiratory tract infections. Vitamin C can play a role in preventing possible infections of the lower respiratory tract[7].

Therefore, the importance of knowledge related to Covid-19 and nutrition to increase body immunity needs to be adequately advocated. Many studies have been carried out in several countries, such as Bangladesh, Sudan, the United States, and China, related to knowledge, attitude, and behavior towards Covid-19[8,14-16]. Most of these studies explore knowledge, attitudes, and attitudes regarding basic information about the coronavirus, the spread of the virus, social distancing, and measures taken to prevent the spread of infection. However, no research has been conducted to analyze knowledge, attitudes, and eating habits, especially regarding nutritional aspects, to increase immunity, especially in Indonesia. Therefore, researchers are interested in seeing an overview of knowledge and attitudes regarding Covid-19 and immunity nutrition in Airlangga University students, which will impact eating habits based on food consumed during the Covid-19 pandemic to increase body immunity[8].

From the previous elaboration, the researchers formulated several problems (1) what is the relationship between knowledge related to nutrition and the habit of eating protein-sourced foods during the Covid-19 pandemic among Airlangga University students, (2) how is the relationship between knowledge related to nutrition and the habit of eating food sources of vitamin A during the COVID-19 pandemic in Airlangga University students, and (3) how is the relationship between knowledge related to nutrition and the habit of eating food sources of vitamin C during the Covid-19 pandemic among Airlangga University students. It is hoped that researchers and readers can find out the relationship between nutrition-related knowledge to increase body immunity with eating food sources of protein, vitamin A, and vitamin C during the co-19 pandemic among Airlangga University students.

METHODS

This study used a descriptive quantitative method through a cross-sectional research design. A cross-sectional study design is an epidemiological study design that emphasizes the observation time of independent and dependent variable data, which was done only at one time[9]. This type of research was observational analytic because it does not carry out the treatment on the research sample. The population in this study were all active undergraduate students at Airlangga University in 2022, consisting of 14 faculties, including 32,667 students. The sample in this research was based on the Lemeshow formula (96 people) using a simple random sampling technique. The inclusion criteria for the research sample were: (1) Active undergraduate students at Airlangga University in 2021, (2) in good physical and mental health, (3) not currently undergoing a special diet (eating patterns due to an illness), and (4) willing to be research respondents. The exclusion criteria in this study were (1) active undergraduate students at Airlangga University other than the 2021 class, (2) those who were sick, and (3) were on a special diet.

The variables in this study were divided into independent and dependent variables. The independent variable was knowledge (related to nutrition to increase immunity). Meanwhile, the dependent variable was eating habits during the Covid-19 pandemic to increase immunity consisting of food sources of protein, vitamin A, and vitamin C in Airlangga University students. The data source in this study was primary data. Data collection techniques included collecting information related to the characteristics of the respondents, information related to the respondents' knowledge, information related to the respondents' attitudes, and information related to the eating habits of the respondents. After data collection, data analysis was carried out. This study used a quantitative method which was included in the type of observational analytic research. The stages included data validity and reliability and data processing, which includes data related to the correspondent's characteristics, knowledge of the correspondent, and eating habits.

Regarding the results of measuring the knowledge variable, it was categorized into two categories: good if the respondent's answer is correct >= 75% and classified as unfavorable if the answer is correct <= 25%. Moreover, related to the measuring results of the eating habit variable, it was divided into three variables: the first, the habit of eating protein foods was divided into three categories: the good category if the average daily protein intake of the respondent is <80% of the 2019 RDA, as well as data analysis which includes descriptive analysis and inferential analysis. The descriptive analysis includes descriptive analysis conducted to see the results of the dependent and

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independent variables. Inferential analysis was performed using the Chi-Square test formula to analyze the dependent and independent variables. Furthermore, the ethical permit was approved by the Research Ethics Committee, Faculty of Dentistry, Airlangga University (No: 573/HRECC.FODM/X/2021).

RESULTS AND DISCUSSION

The research was carried out online by filling out the Google form for respondents who were given direct guidance through the online questionnaire and via personal chat if the respondent had questions to ask when filling out the questionnaire. This method was done because the Restrictions on Community Activities (PPKM) were being implemented due to the Covid-19 pandemic. Regarding gender, this study was divided into two, men and women aged 19 to 23. The living environment in this study was divided into two categories: living with the main family (house) and living separately from the main family (boarding house, contract, or dormitory). Respondents were students from 14 scientific clusters at Universitas Airlangga for bachelor's degree students. It was found that most of the respondents in this study were students at the Faculty of Public Health (FKM), were female, aged 21, and lived with their main family at home during the Covid-19 pandemic.

Table 1. Table of characteristics of correspondent students based on gender, age, and knowledge group

Category	Frequency (n)	Percentage (%)
Gender		
Male	9	9,4
Female	87	90.6
Total	96	100.0
Age		
19 years old	6	6.3
20 years	22	22.9
21 years	34	35.4
22 years	29	30.2
23 years	5	5.2
Total	96	100.00
Faculty		
FK	7	7.3
FKG	6	6.3
FKH	8	8.3
FKM	21	21.9
FISIP	5	5.2
Fapsi	6	6.3
FPK	7	7.3
FH	4	4.2
Pharmacy	3	3.1
FST	9	9.4
FIB	3	3.1
FEB	9	9.4
FKep	6	6.3
FTTM	2	2.1
Total	96	100.00

Faculty of Medicine (FK); Faculty of Dentistry (FKG); Faculty of Veterinary Medicine (FKH) ; Faculty of Public Health (FKM); Faculty of Social and Political Sciences (FISIP); Faculty of Psychology (Fapsi); Faculty of Fisheries (FPK); Faculty of Law (FH); Faculty of Pharmacy (Pharmacy); Faculty of Science and Technology (FST); Faculty of Humanities (FIB); Faculty of Economy and Business (FEB); Faculty of Nursing (F Kep); Faculty of Advanced and Multidisciplinary Technology (FTTM)

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Table 2. Table of respondents' knowledge related to nutrition to increase immunity

No	Question	Correct answer		Wrong answer	
		n	%	n	%
1	One of the efforts to prevent contracting the COVID-19 infectious disease is increasing immunity by consuming nutritious food	96	100.0	0	0.0
2	What do you know about immunity	94	97.9	2	2.2
3	What do you know about factors that can increase immunity	93	96.9	3	3.1
4	What do you know about factors that can reduce immunity	69	71.9	27	28.1
5	What do you know about foods that can increase the body's immunity	94	97.9	2	2.1

Respondents' knowledge was assessed by giving a questionnaire containing multiple choice questions related to nutrition to increase immunity. Regarding knowledge related to nutrition to increase immunity, the knowledge of respondents was good, as can be seen from the percentage of correct answers on knowledge related to the definition of immunity, factors that can increase immunity, types of food that can increase immunity, and an understanding of increasing immunity by consuming nutritious intake. However, the respondent's knowledge was still lacking, as can be seen from the high percentage of wrong answers, knowledge related to factors that can reduce immunity was 28.1%. The total score of the question items in the knowledge questionnaire related to nutrition to increase immunity obtained an average value of 86.46 with a standard deviation of 16.79. The highest score at the level of knowledge related to nutrition to increase immunity was 100. Table 3 shows that students already have good knowledge related to nutrition to increase immunity (75%). Meanwhile, another 25% of students still had insufficient knowledge related to nutrition to increase immunity.

Table 3. Level of nutritional knowledge of Airlangga University students

Level of Nutrition Knowledge		
Category	**Frequency (n)**	**Percentage (%)**
Not enough	24	25.0
Well	72	75.0
Amount	96	100.0

The Relationship of Knowledge Related to Nutrition in Efforts to Increase Immunity with the Habit of Eating Food Sources of Protein, Vitamin C, and Vitamin A During the Covid-19 Pandemic in Airlangga University Students

Table 4 shows that the majority of respondents, 77.1% of students, had relatively low protein intake. As many as 16.7% of students had an average protein intake, while 6.3% of other students had more protein intake. Then, it was found that most respondents (63.5%) had a relatively low vitamin C intake. As many as 36.5% had a sufficient intake of vitamin C. Furthermore, it was also found that most respondents (53.1%) had inadequate intake of vitamin A. As many as 46.9% had a sufficient intake of vitamin A

Table 4. Frequency distribution of eating habits of protein, vitamin c, and vitamin intake during the 2021 covid-19 pandemic

Nutritional Substance Intake Category	n	%
Proteins		
Not enough	74	77.1
Normal	16	16.7
Over	6	6.3
Vitamin C		
Not enough	61	63.5
Enough	35	36.5
Vitamin A		
Not enough	51	53.1
Enough	45	46.9

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Table 5. The Relationship of Knowledge Related to Nutrition in Efforts to Increase Immunity with the Habit of Eating Food Sources of Protein, Vitamin C, and Vitamin A During the Covid-19 Pandemic in Airlangga University Students

Nutritional Sources	Knowledge related to nutrition	Eating habits during a pandemic						Amount (%)	p-values
		Not enough		Normal		More			
		n	%	n	%	n	%		
Proteins	Not enough	24	25.0	0	0.0	0	0.0	100.0	0.009
	Well	50	52.1	16	16.6	6	6.3		
Vitamin C	Not enough	23	23.9	1	1.1			100.0	0.000
	Well	28	29.2	44	45.8				
Vitamin A	Not enough	22	22.9	2	2.1			100.0	0.001
	Well	39	40.6	33	34.4				

Based on Table 5, it can be seen that the protein intake of students who were classified as lacking knowledge related to nutrition to increase immunity was classified as lacking by 25%, while students with knowledge related to nutrition in efforts to increase immunity were classified as good (52.1%). The protein intake of students classified as usual with knowledge related to nutrition to increase immunity was classified as good at 16.6%. Meanwhile, the protein intake of students classified as having more knowledge related to nutrition to increase immunity was classified as good at 6.3%. The results of testing the relationship of nutrition-related knowledge to increase immunity with eating protein-source foods obtained a p = 0.009 <0.05. These findings mean that H0 was rejected.

Table 5 also shows that the vitamin C intake of students classified as lacking nutrition related to increasing immunity was classified as lacking at 23.9%, while students with knowledge related to Covid-19 are classified as good at 29.2%. Meanwhile, the vitamin C intake of students classified as sufficient with knowledge related to nutrition to increase immunity was classified as lacking at 1.1%, while students with knowledge related to nutrition to increase immunity were classified as good at 45.8%. The results of testing the relationship of knowledge related to nutrition to increase immunity with eating food sources of vitamin C obtained a value of p = 0.000 <0.05. These findings mean that H0 was rejected.

Vitamin A intake for students classified as lacking nutrition-related to increase immunity was classified as lacking at 22.9%, while students with knowledge related to increasing immunity were classified as good at 40.6%. Meanwhile, the vitamin A intake of students classified as lacking in nutrition to increase immunity was classified as lacking at 2.1%, while students with knowledge related to nutrition in efforts to increase immunity were classified as good at 34.4%. The results of testing the relationship of knowledge related to nutrition to increase immunity with eating food sources of vitamin A obtained a p= 0.001 <0.05. These findings mean that H0 was rejected.

Knowledge can be seen or known directly from experience, through the senses, or even through reason spontaneously[10]. It was probably because knowledge was included as one of the factors that can influence an individual's eating habits. The study's results illustrate a significant relationship between nutritional knowledge to increase immunity and consuming vitamin C food sources during the Covid-19 pandemic among Airlangga University students with a p-value <0.05. This finding was related to the study by Sediaoetama, the level of one's knowledge influences behavior patterns in food selection activities, determining whether or not individuals understand the benefits and nutrients contained in the food they consume[11]. Behavior based on good knowledge will last longer than behavior without good knowledge[12]. It is the daily food selection behavior that will later form an individual's eating habits. Syam et al. said that nutritional intake, especially regarding adequate immune-boosting components such as vitamin C, is fundamental to increasing the body's immunity during the Covid-19 pandemic to prevent Covid-19 infection[13].

These results were consistent with research conducted by Dewi in Hezima et al., explaining that there was a significant positive relationship between knowledge and consumption patterns or eating habits in respondents with a significance value of r 0.545 > α 0.05[14]. Aulia in Hezima et al. in his study explained that there was a significant relationship between knowledge and food intake with a p-value <0.05[1,14]. Research conducted by Mujiburrahman also obtained similar results that there was a relationship between knowledge and behavior to prevent Covid-19, namely increasing eating habits during the Covid-19 pandemic using the Spearman test and obtaining a p-value = 0.001 (p <0.05)[2,14]. This finding can be evidence that knowledge does have a significant relationship with an individual's eating habits.

Furthermore, this study's results also explained a significant relationship between nutritional knowledge to increase immunity and the habit of eating food sources of protein and vitamin A during the Covid-19 pandemic among Airlangga University students, with a p-value <0.05. This study is in line with a study conducted by Bakti in Gelsetzer, which explains a significant relationship between nutritional knowledge and adolescent food consumption patterns with a p-value of 0.032 (p <0.05) but with a negative correlation direction with a correlation coefficient value of - 0.214[15]. This result can happen because someone with good knowledge does not reflect good behavior in choosing daily food. This finding was in line with the opinion put forward by Aisyah in Hezima, which shows that good knowledge was not

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always manifested in good eating behavior either[14].

This study found that most of the sample were public health students who tended to have good knowledge regarding nutrition to increase immunity (75%), so it becomes an advantage in this study where the related samples are students who already have more or less good knowledge because of their high intellectual level. However, in terms of implementing eating habits from the knowledge they have, of course, it will be different for each student[16]. Not only knowledge some factors can influence a person's eating habits, such as food preferences, economic, social, and cultural factors, religion, as well as education or health awareness[17]. This result can be a factor in the level of eating habits of most students who were still classified as lacking compared to the standard Nutrition Adequacy Rate (RDA).

Furthermore, the limitations of this study were filling out the food habits questionnaire using (SQ-FFQ) carried out by respondents independently because they used online surveys, so the data obtained had a less accurate level. However, researchers have tried to provide directions when filling out the questionnaire. A guide was given in the form of a photo book of foodstuffs and a table of food ingredients to all respondents to make it easier for respondents to fill in the data. Then the researcher will contact the respondent again if the data obtained is still dubious so that the study's limitations could still be minimized by the data that is not accurate to the researcher.

CONCLUSIONS

To conclude, the respondents in this study were female students of the Faculty of Public Health (FKM), 21 years old, and living with their main family at home during the Covid-19 pandemic. Then most students have a good level of knowledge related to nutrition to increase immunity (75%), except for factors that can reduce immunity. Most respondents said that during the Covid-19 pandemic, they increased their food intake to increase their body's immunity. However, if eating habits were assessed in terms of the adequacy level (amount) of nutritional intake, the habit of eating foods that are sources of protein, vitamin A, and vitamin C in most students during the Covid-19 pandemic was still classified as below the RDA standard. Then it was found that there was a significant relationship between knowledge related to Covid-19 and nutrition to increase immunity by eating food sources of protein, vitamin A, and vitamin C during the Covid-19 pandemic among Airlangga University students (p-value <0.05). So it can be concluded that knowledge about covid-19 and nutrition can influence eating habits of foods containing protein, vitamin A, and vitamin C, affecting the strength of the body's immune system.

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