EFFECTIVENESS OF ONLINE-BASED NUTRITION EDUCATION IN INCREASING KNOWLEDGE AND SELF-EFFICACY

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ABSTRACT

The latest COVID-19 pandemic has taught the importance of nutrition and immunity to prevent diseases, in which case the fatality rate exceeded 2.58%. Immunity is believed to be one of the critical efforts to prevent the spread of COVID-19. This is, for sure, inseparable from nutritional intake, exercise, and environmental factors. However, that needed to be better understood by many people. This study aims to assess the effectiveness of online-based nutrition education in increasing knowledge and self-efficacy to maintain a balanced nutritional intake and implement hygiene. Online-based nutrition education was done using video conference by Zoom conference and text-based education methods using Telegram. Each session is held for approximately two hours. Samples were all collected voluntarily, comprising an adult population aged 19 – 59. Knowledge and self-efficacy were measured using a structured questionnaire. In total, 217 samples were recruited. 92.2% of participants were female, the average age was 29 ± 10.04, 34.1% worked as civil servants, and the majority, 52.1%, came from East Java. Education with the digital learning method succeeded in increasing nutritional knowledge from a score of 55.9 to 91.8 (p<0.000) and significantly increasing self-efficacy of consuming balanced-nutritious food and self-efficacy of a clean and healthy lifestyle (p<0.000). In conclusion, online-based nutrition education proved effective in increasing knowledge and self-efficacy. Hence, program duplication with a broader range of subjects can be done nationally.

Keywords: *online nutrition education, nutrition, knowledge, self-efficacy*

INTRODUCTION

The COVID-19 pandemic, a global crisis that has persisted for over 2 years, has had far-reaching effects on various aspects of life, including a significant rise in mortality rates (Koh, 2021). The treatment of COVID-19 remains uncertain, and the rapid deterioration of health in affected individuals underscores the urgency of prevention. Therefore, it is imperative to optimize prevention efforts, particularly in the areas of nutrition and hygiene, as indicated by the 3M guidelines (Wearing masks, Washing hands, Avoiding crowds) (WHO, 2020).

More and more information is spreading about COVID-19, from *hoax* information to official and accurate information. This situation makes many people feel anxious and afraid, and many negative responses arise, such as obsession with hoarding medical devices and panic buying. It can have a psychosomatic impact due to a lack of knowledge of distinguishing accurate information and not. One piece of information often misused by the public is about proper nutrition during the COVID-19 pandemic (Ruani et al., 2023). For example, claims that certain foods can cure COVID-19, consumption of certain foods can aggravate and accelerate the transmission of COVID-19, and so on. Misinformation that spreads quickly can cause unrest in the community. For this reason, a valid source of information is needed and can be trusted by the public to reduce the level of concern and misperceptions of information about COVID-19.

Nutrition is crucial in COVID-19 prevention, starting from nutritional status and macronutrient requirements (Gombart, et al. 2020). A study in 2020 showed that the number of positive cases of COVID-19 was more prevalent in individuals with overweight or BMI >25 kg/m^2. In addition, obese and overweight patients also require more

ventilators when confirmed positive, with a ratio of 47.1% in normal nutritional status and 73.7% in obese and overweight patients (Simonnet, A., 2020). This study confirmed that as the nutritional status increases, it can increase the risk of contracting COVID-19 due to immunodeficiency and the risk of becoming more severe when already infected (Alberca, et al. 2021). Meanwhile, malnutrition also increases the risk of infection because malnutrition is associated with decreased immune work, lymphoid tissue atrophy and increased immunodeficiency (Di Renzo, et al. 2020). Micronutrients, especially vitamins B complex, C, D, E, and zinc, are essential for the immune system (Gombart, et al. 2020). People need to know how to provide balanced nutrition regarding COVID-19 prevention so that they can apply it in their daily lives. This study aims to evaluate the effectiveness of online education about nutrition and COVID-19 to increase knowledge and self-efficacy.

METHODS

This study used a cross-sectional design to increase knowledge and self-efficacy through online methods, including Zoom conferences and telegram lectures. Since the COVID-19 pandemic, we have begun to adapt to online learning because there were physical distancing recommendations. To prevent the transmission of COVID-19, the delivery of information and direct counseling to the public needed to be improved. In detail, the webinar activities were carried out twice on July 9 and 16, 2020, from 10.00 to 12.00 local time with the online method using Zoom media. The materials provided in the webinar session covered COVID-19 and its influential factors, nutrition in COVID-19, and food safety during the COVID-19 pandemic. Each material was delivered for 30 minutes and continued with a question and answer session. In this webinar, participants also received an *e-booklet* containing information about nutrition during the pandemic.

Furthermore, the education using *Telegram* was text-based. One thousand one hundred sixty-seven participants followed this telegram-based education. The material presented in the lecture-

telegram was the same as the webinar but delivered in text form. Material delivery in the text is more permanent because participants could follow the education at any time. The *Telegram* session was delivered for 60 minutes. The material presentation was delivered through images/slides and exposure via text. The participants considered this telegram-based nutrition education very useful because the material could be read repeatedly. After the presentation via text, the session continued with questions and answers. The Q&A was divided into three sessions, each about 20 minutes, with five questions in each session. The participants were enthusiastic about the Q&A session, as evidenced by the number of questions. Before and after the delivery of the material, pretests and posttests were also filled in via telegram to assess changes in the participants' knowledge of education. In addition to receiving material via text, participants were provided with a Nutrition and Immunity booklet during the COVID-19 Pandemic, which can be used as a guide or shared with other colleagues.

The knowledge questionnaire on the role of nutrition and immunity contained ten multiple-choice questions. The results of the nutrition knowledge questionnaire were then assessed and classified into 3 (three), i.e. poor knowledge (score <60), moderate knowledge (score 0-80) and good knowledge (score >80) (Khomsan, 2004). Meanwhile, the self-efficacy questionnaire was developed independently by the team consisting of 2 sets of questionnaires, i.e., the self-efficacy questionnaire to consume balanced nutrition during the COVID-19 pandemic and self-efficacy to follow health protocols to prevent COVID-19 (Rachmah, et al. 2021). The researchers themselves developed the two questionnaires that became the research instruments based on the nutrition education material provided to the target group. The questionnaire was filled in twice, that is, before and after being given a nutrition education intervention through the lecture method. Differences in pre-post test scores were analysed using the Pearson test (SPSS 26, IBM). This research has received an ethical certificate issued by the Health Research Ethics Committee, Faculty of Public Health Universitas Airlangga, with certificate number No. 20/EA/KEPK/2021.

RESULTS AND DISCUSSIONS

The first online education activity was attended by 229 participants, and the second activity was attended by 121 participants. The participants were mostly from the general public (non-medical), dominated by young and middle-aged adults distributed from the Talaud Islands to Mamuju.

Of the total participants, 217 participants completed the pre-post. Based on Table 1, the 1st webinar participants were primarily female (92.9%), with an average age of 29 years ± 10.04, and most occupations as students and civil servants (34.1%).

The results of nutrition knowledge before and after the online education session are presented in Tables 2 and 3. Respondents' knowledge scores increased significantly before and after the nutrition education session (p<0.000) (Table 2). With the positive results, this nutrition and immunity online education can be duplicated with broader community coverage.

The following results were obtained in the table of knowledge levels before and after education (Table 3). In the pre-test before education, more than half of the total respondents (52.7%) had poor scores (less than 60), while only 11 respondents (4.6%) had good scores. Then, after education, there was a significant change in results, which was more than three-fourths of the participants got a good score (>80) of 83.1%, while respondents with poor scores (<60) were only 5.1%.

Respondents' knowledge was significantly increased after being given online nutrition education. This was in line with previous studies among adults in Semarang, Indonesia (Tsani, et al. 2020). From the questions about nutrition and immunity knowledge, most respondents knew about the transmission of COVID-19, the importance of protein intake and how to maintain food safety. Protein is essential to form antibodies in white blood cells; with sufficient protein intake, the body can recognise which obstacles must be killed and cleaned from the body so that the body is not infected (natural killer cell) (Cruzat et al. 2018). However, knowledge about the role of micronutrients on immunity and food sources of micronutrients still needs to be improved. This can be seen from the low number of correct answers to questions 5, 5,6,7,8, and 9. The level of knowledge can determine a person's behaviour towards certain health behaviours, although it is not the only factor (Ajzen, 2002). Research by Azrimadaliza et al. (2021) also showed that respondents' knowledge and attitudes related to nutrition efforts in increasing body immunity during the COVID-19 pandemic were quite good. Still, the behaviour or implementation of nutrition in increasing body immunity during the COVID-19 pandemic was low.

Micronutrients can be supplied by a balanced diet, especially adequate consumption of fruits and vegetables (Ali&Tsou, 1997). Unfortunately, over 90% of Indonesian adults consume fewer vegetables and fruits or do not meet daily consumption recommendations (Indonesia Ministry of Health, 2019). Implementing balanced nutrition is a way to prevent COVID-19 prevention that

Table 1. Respondent Characteristic

Characteristic	n	%
Sex		
Men	17	7.8
Women	200	92.2
Age (years)		
Mean	29 ± 10.04	
Min - Max	18-60	
Occupation		
Private workers	13	6.0
Civil workers	74	34.1
Entrepreneur	3	1.4
Temporary workers	16	7.4
University Student	98	45.2
Students	1	0.5
Housewife	2	0.9

Table 2. Knowledge Level Before and After Education

	Before	After	P-value
Mean Score	55.9 ± 14.1	91.8 ± 15.9	
Min-max	30 - 100	20 - 100	
Knowledge Level (n[(%])			0.000
Good (> 80)	11 (5.1)	178 (82)	
Moderate (60-80)	34 (15.7)	21 (9.7)	
Poor <60	172 (79.3)	18 (8.3)	

needs to be implemented because daily intake affects nutritional status, and poor nutritional status can reduce immunity (Herzog & Rundles. 2015; de Heredia et al., 2012). Foods high in vitamin A are found in carrots, mangoes, papaya, green leafy vegetables; zinc is found in red beans, corn, shrimp, cowpeas, eel, soybeans, green beans; vitamin C is found in cashew fruit, guava, mango, banana, papaya; vitamin D is found in animal proteins such as skipjack, chicken eggs, milkfish, mullet, eel, quail eggs, fish eggs. Vitamin C acts as an antihistamine agent that can relieve flu symptoms such as sneezing, runny nose, and sinus swelling that can appear in people with COVID-19 (Carr & Maggini, 2017). Meanwhile, vitamin D plays a role in reducing the risk of infection by enhancing cellular immunity and reducing the cytokine storm caused by the innate immune system (Grant, et al. 2020). With different functions, all vitamins and minerals work simultaneously for an optimal immune system.

Table 4 shows the mean score of self-efficacy or self-confidence in eating nutritious, balanced foods and maintaining clean and healthy living behaviours.

Self-efficacy scores were obtained from each of the ten questions. Participants had very good self-efficacy in maintaining hygiene and sanitation and implementing health protocols during the pandemic, both before and after the education. The average score on each statement increased between 0 - 0.5 points. Despite the education, the statement to continue using a mask when leaving the house did not change. Still, the average score was 9.5, indicating that participants were particular

Table 4. The mean total self-efficacy score is for consuming balanced nutrition and healthy hygiene behaviour before and after nutrition education.

	Before	After	*P-value*
Consume Balanced Nutrition			
Mean ± SD	73 ± 14.87	81.06 ± 14.56	0.000
Min – max	33 – 100	39 – 100	
Healthy Hygiene Behavior and Health Protocols			
Mean ± SD	88 ± 11.66	90.68 ± 11.10	0.000
Min – max	39 – 100	43 – 100	

to be able to do this. In addition, the statement to use a mask when leaving the house is the statement with the highest average score before and after education.

Respondents' self-efficacy was also increased after giving online nutrition education, which is parallel to previous studies using 6-week online nutrition education (Stark et al. 2011). Self-efficacy in consuming balanced nutrition consists of several questions, i.e., how confident are you in maintaining a balanced nutritional consumption pattern when income drops, at the beginning of the month, at the end of the month, when fruit prices rise, when animal side dish prices rise, when vegetable prices rise, when you are lazy to cook, when you are sick when eating time is limited, and when the corona outbreak is over. Participants' self-efficacy before the material was presented was good because they believed they could still consume balanced nutritional foods during the pandemic. The lowest score of respondents' confidence was obtained when eating time was

Table 3. Frequency of Respondents Who Answered Correctly

No	Question	Before [n(%)]	After [n(%)]
1.	Covid-19 Spreading	235 (99.2)	234 (98.7)
2.	The causes of overweight at risk of getting COVID-19	148 (62.4)	222 (93.7)
3.	Certain foods/ supplements that can treat COVID-19	198 (83.5)	232 (97.9)
4.	The role of proteins to prevent getting infected and eliminate COVID-19	231 (97.5)	233 (98.3)
5.	Foods containing zinc (Zn)	132 (55.7)	218 (92.0)
6.	Number of fruits (servings) to meet daily vitamin C requirement	52 (21.9)	212 (89.5)
7.	A higher source of vitamin A than carrots	56 (23.6)	207 (87.3)
8.	Vitamin D source foods	32 (13.5)	199 (84.0)
9.	Vitamins that affect natural killer cell productivity and activity	31 (13.1)	192 (81.0)
10.	How to maintain proper food safety during the COVID-19 pandemic	219 (92.4)	222 (97.9)

limited and the highest when the epidemic was over. From this result, it can be interpreted that when eating time is limited, consuming balanced nutrition will be more difficult. So, it does not close the chance for fast food to lead to the types of food most often consumed by the community. It can be said that participants consider nutritionally balanced food to take a long time to prepare. The average score in this statement increased by 0.9 points after education. However, respondents felt confident that after the outbreak, they were more satisfied with consuming balanced nutrition.

Statement of continuing to wash hands as often as possible when leaving the house was also the other highest statement after education. This is because the education also explained the difference between using soap and water and hand sanitisers during the pandemic. The statement with the highest point increase was to continue using hand sanitisers even though the price increased by 0.5 points. This shows that despite barriers to maintaining cleanliness, participants have the confidence/commitment to continue using hand sanitisers even though the price has increased.

CONCLUSION

Online education successfully proved its effectiveness, as evidenced by the increase in nutrition and immunity knowledge and self-efficacy in consuming balanced nutrition and healthy hygiene behaviors. Therefore, similar programs can be duplicated with the same approach so that more people understand the importance of nutrition in immunity. The Health Office of the Ministry of Health and related stakeholders can duplicate this activity.

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