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Nutrition Webinars for Students a nd Health Professionals: Indonesian Study During Covid-19 Pandemic

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Abstract

Recently, there has been an increase in obesity cases among adolescents in Indonesia with a prevalence rate of 19%, which exceeds the national prevalence of 16%. This was caused by the decrease in physical activities and consumption of fruit and vegetables by 95% of the population during the COVID-19 pandemic. This study aimed to foster the development of a Nutrition Education Center (Nutrecent) as a distance learning to promote the consumption of plant-based foods containing polyphenols such as vegetables and fruits. This was a quasi-experiment with three Nutrecent (Nutrition Education Centre) Webinar series and an international webinar. Participants were high school and college students, health workers, and the general public. A total of 654 participants were included in the analysis. The statistical results showed no significant improvement in knowledge due to the Nutrecent webinar series activities, but there was a significant improvement due to the international webinar (p-value < 0.001). Online learning is only effective for students and adults with previous knowledge of the webinar topic. Consequently, there is a need to include the importance of consuming plant-based foods in the school curriculum.

Introduction

The spread of the coronavirus disease 2019 (COVID-19) posed a huge challenge to education systems worldwide, due to lockdown and social distancing recommendations implementations. Various health problems have become a concern in several countries since the implementation of social restrictions due to the COVID-19 pandemic. Furthermore, a study on 4,342 elementary school (SD) and junior high school (SMP) students showed that 24.9% experienced anxiety, depression by 19.7%, stress by 15.2% (Tang *et al*., 2021) socially, and psychologically, yet rigorous investigation into their mental health during this period is still lacking. Methods: A cross-sectional online survey of 4-342 primary and secondary school students from Shanghai, China was conducted during March 13–23, 2020. Besides demographic information, psychological distress (including depression, anxiety, and stress, as well as other eye-related health issues. Meanwhile, another study on 123,535 children aged between 6-13 years discovered that distance learning was associated with an increased prevalence of myopia (Wang *et al*., 2021)Setting, and Participants: A prospective cross-sectional study using school-based photoscreenings in 123535 children aged 6 to 13 years from 10 elementary schools in Feicheng, China, was conducted. The study was performed during 6 consecutive years (2015-2020. Several deaths during the pandemic of COVID-19 due to home learning led to a Joint Decree by the Minister of Education and Culture, Religion, Health, and Home

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Affairs with reference number 03/KB/2021, 384/2021HK.01.08/MENKES/4242/2021, and 440-717/2021 respectively. The decree contained guidelines for the implementation of learning during the COVID-19 pandemic. The government also allowed face-to-face learning due to local government policies and permission from parents.

Consequently, the implementation of home learning led to a change in students' physical activity and food consumption. Furthermore, there was a decrease in physical activities in Indonesia and several countries such as Canada, Saudi Arabia, and Italy (Pietrobelli *et al*., 2020; Radwan *et al*., 2021;such restrictions could precipitate unintended negative consequences on lifestyle behaviors. The main objective of this study was to investigate the prevalence and determinants of unhealthy behavior changes during the COVID-19 lockdown among residents of the United Arab Emirates (UAE Atmadja *et al*., 2020; Moore *et al*., 2020)limiting sedentary behaviours (SB. Over 50% of Indonesians consumed few vegetables and fruits during the COVID-19 pandemic (5), which led to massive weight gain among the people. Poland also experienced a decrease in the consumption of these classes of food, while an increase in consumption of the Mediterranean diet occurred in Italy (Sidor & Rzymski, 2020)which later developed into a pandemic, has forced different countries to implement strict sanitary regimes and social distancing measures. Globally, at least four billion people were under lockdown, working remotely, homeschooling children, and facing challenges coping with quarantine and the stressful events. The present cross-sectional online survey of adult Poles (n = 1097 with no difference in the consumption rate of vegetables and fruit (Pietrobelli *et al*., 2020). Fruit and vegetables are rich in polyphenols which help to increase the body's immunity against various diseases and health problems.

Polyphenols are bioactive components widely distributed in plants such as vegetables, fruit, coffee, and tea (Pérez-Jiménez *et al*., 2010). Several studies have discovered the benefits of consuming polyphenols, which include its anti-inflammatory effects on atherosclerosis, type 2 diabetes mellitus, cancer, and death (Medina-Remón *et al*., 2017; Pounis *et al*., 2018in what we believe to be a novel, holistic approach. Methods: We analyzed 21 302 participants (10 980 women and 10 322 men, aged ≥35 y; Zhang & Tsao, 2016; Little *et al*., 2017; Penczynski *et al*., 2019; Wisnuwardani, De Henauw, Forsner, *et al*., 2020; Wisnuwardani, De Henauw, Ferrari, *et al*., 2020). Also, the consumption of flavonoids from these foods during adolescence is indirectly associated with proinflammatory scores in early adulthood (Penczynski *et al*., 2019), while increased consumption is associated with a low pro/anti-inflammatory biomarkers ratio in European adolescents (Wisnuwardani *et al*., 2020) and weight loss in Europe (Wisnuwardani *et al*., 2020).

East Kalimantan is a province with a Tropical rainforest that contains diverse plants rich in polyphenols such as dragon fruit. Furthermore, a systematic review and meta-analysis of 401 articles concluded that consumption of dragon fruit significantly reduced fasting sugar levels in pre-diabetes patients (Poolsup *et al*., 2017). Also, the fruit has various benefits as a health supplement and it serves as an antimicrobial, anti-hypercholesterolemic, anti-diabetic, and anti-cardiovascular agent (Wahdaningsih *et al*., 2020). The prevalence of obese and very obese conditions among adolescents aged between 13-15 years was 12% and 7.1%, respectively (Kemenkes RI, 2018), which exceeds the national prevalence of 11.2% and 4.8%. Similarly, there was an increase in the prevalence among teenagers between 16 and 18 years due to low consumption of vegetables and fruit by 98% of the population (Kemenkes RI, 2018).

Subsequently, various activities have been introduced for students, parents, teachers, and school canteen providers to promote healthy food consumption (Dewayani & Sukihananto, 2018)consisting of 4th and 5th grade elementary school children and their mothers in SDN Tugu 4, Depok City, Indonesia. Demographic data were also taken for each. The instruments used the Food Frequency Questionnaire and questions about the balanced nutritional guidelines. Statistical analysis conducted a univariate (descriptive. A study in Samarinda concluded that training of

child nutritionists increases the knowledge of healthy and safe food consumption behavior (Iwan *et al.*, 2015). Therefore, it is necessary to introduce diversification of vegetables and fruits in humid tropical forests by educating the parties involved namely students, parents, and teachers for face-to-face learning in schools. Also, efforts are needed to promote the consumption of plant-based foods on digital education platforms such as the Nutrition Education Center (Nutrecent), a digital learning medium established for Indonesian adolescents, especially in East Kalimantan. This study aimed to increase nutritional knowledge, and consumption of plant-based foods, reduce the prevalence of obesity in Indonesia, and increase body immunity in preparation for face-to-face learning in the province during the COVID-19 pandemic.

Methods

This was a quasi-experiment with three Nutrecent (Nutrition Education Centre) Webinar series and an international webinar. Participants of the webinar series were high school students, while participants of the international webinar were college students, health workers, and the general public. The study was conducted between 15 November and 1 December 2021. Participants were recruited via social media (Instagram, YouTube, and TikTok). Ninety-one participants enrolled in the Nutrecent webinar, but only 45 participants were included in the analysis. The dropout participants were due to missing data from pre and post-test questionnaires. For an international webinar, 929 attended participants from Indonesia and other countries such as Malaysia, Thailand, Belgium, and the Netherlands. However, only 654 participants from the Zoom meeting were included in the analysis. As they took the pre and post-tests. Participants who joined the webinar through YouTube did not fill out the pre-test because the pre-test questionnaire was given during webinar registration. Informed consent was obtained and agreed upon by participants and the study proposal was also approved by the Ethical Review Committee at the Faculty of Medicine, Universitas Mulawarman (No. 98/KEPK-FK/XI/2021).

The Nutrecent activities began with creating social media handles such as Instagram, TikTok, and YouTube, which contained information on the benefits of consuming vegetables and fruit, socializing Nutrecent activities, and how to prepare vegetables and fruit dishes. Furthermore, social media was chosen as the medium for enlightenment due to the tendency of high school students to use the platforms. Nutrecent's main activity was a series of webinars themed "Healthy Training during the COVID-19 pandemic," which was held for 3 weekends a month through Zoom meetings. On the first day, the students were educated about balanced nutrition and how to prepare for physical learning during the COVID-19 pandemic. Furthermore, the importance of consuming plant-based foods such as vegetables and fruit was taught on the second day, while the exploration of processed foods from humid tropical forests with examples was taught on the last day.

Subsequently, the webinar series activities for less enthusiastic adolescents were evaluated, and an international webinar was conducted through Zoom. The theme of the meeting was Lifestyle and mental Health. The presenters presented about the association of mental health with lifestyle, and the consumption of fruits and vegetables, which help to reduce the risks of degenerative and mental health diseases. A univariate analysis was carried out to describe the characteristics of the sample population using frequency and percentage distributions, while bivariate analysis was used to determine the increase in knowledge of webinar participants using paired t-tests. The conclusion was drawn with the rule that when Sig (2-sided) <0.05, then H_0 is rejected, and when Sig (2-sided) > 0.05, then H_0 is accepted. The IBM SPSS program version 23 was used for data management and statistical analyses.

Results and Discussion

During the COVID-19 pandemic, the government recommends avoiding gatherings with large crowds, consequently, the Nutrecent training was conducted through Zoom meetings, and information related to the training was disseminated through social media platforms. Furthermore, 70 participants

attended the first webinar, and knowledge improvement was carried out by pre-post-test (Table 1). However, only 28 answered the test questions because it involved 3 hours of independent learning. Based on in-depth interviews with 3 participants, it was discovered that the assignment was burdensome to the students as they expected a vacation from their routine study on Saturdays. Also, the webinar activity was carried out in the morning and students were eager to get up late during the weekend, which led to the low turn-up for the event.

Fifteen participants attended the second webinar, and only 5 answered the post-test. The decline in Nutrecent webinar series participation was due to boredom associated with online learning and this was backed up by interviews with students where they stated that weekly online training was very boring. Students also experienced distance learning at school coupled with many assignments, which also contributed to the low participation in the webinars. Additionally, there were some drawbacks to routine distance learning, which include its boring nature, inability to supervise activities and to provide direct feedback to participants.

The decrease in participants of the second webinar series became evaluation material, leading to the re-socialization during the third webinar. Previously, the webinar was attended by the same participants, but due to a 76% decrease from 70 participants in webinar series 1 to 15 in the second, it was necessary to invite new students. Therefore, re-socialization was carried out by sharing information about the webinar for 1 week on social media such as WhatsApp, TikTok, Instagram, and YouTube. Meanwhile, 26 participants attended the third

Table 1. Characteristics of Participants in Nutrecent.

Characteristics	First webinar		Second webinar		Third webinar	
	n	%	n	%	n	%
Sexes						
Boys	12	17	4	27	5	19
Girls	58	83	11	73	21	81
Class						
X	25	36	4	27	4	16
XI	19	27	7	46	5	19
XII	26	37	4	27	17	65
City						
Bengkulu	4	6	0	0	0	0
Bima	0	0	0	0	1	4
Berau	18	26	2	13	2	8
Bontang	9	13	3	20	6	23
Kutai Barat	0	0	0	0	1	4
Kutai Kartanegara	15	21	2	13	3	12
Kutai Timur	0	0	0	0	2	8
Balikpapan	0	0	0	0	1	4
Samarinda	16	23	8	54	9	35
Nunukan	0	0	0	0	1	4
Sinjai	2	3	0	0	0	0
Total	70	100	15	100	26	100

Data source: primary data in 2021

Figure 1. Webinar series and International Webinar in Nutrition Education Centre in 2021

webinar, but only 12 took the tests. It was also observed that independent learning through assignments was still a problem in the series. Although the task was easier than the previous ones, it was still a barrier that hindered students from taking the post-test. However, all the webinar series activities have been uploaded to Nutrecent's YouTube and Instagram pages.

Although there was a decrease in participants taking the post-test, the available ones were very active in discussing with the presenters, especially regarding daily problems in consuming vegetables and fruit. Furthermore, rewards for active discussion were also given at each webinar series. The participants of series 1 were 70 students, which included 82% female and 37% male. A total of 26% of the students came from Berau, 23% from Samarinda, and 21% came from Kutai Kartanegara. Furthermore, 57% of the participants lacked knowledge about "Healthy Adolescent Tips and Tricks During the COVID-19 Pandemic" before the event started.

Only 28 participants out of 70 took the post-test, which led to the use of only 28 students for the paired t-test. Furthermore, the sample population contained 82% female and 39% Class X students that came from East Kalimantan with 39% from Samarinda, 36% from Berau, 4% from Sinjai and 1% came from Bengkulu. Although there was a knowledge improvement due to the webinar, it was insignificant with a p-value of 0.083 as shown in Figure 2. Meanwhile, the theme of the second webinar was 'Plant-Based Foods during the COVID-19 Pandemic', which was organized for Senior High School students one week after the first edition. The event was attended by the same participants from the first edition, but there was a 79% decrease in participation. Furthermore, most of the students that attended were male, accounting for 53% of the total participants, and 87% showed a good knowledge of the topic. The decrease in participation was due to the conduction of socialization with the same set of students in the previous webinar.

Only 5 participants out of 15 filled out the post-test, and data analysis on knowledge improvement was carried out on only the 5 students. However, there was an increase in the knowledge of the samples after the webinar (p-value = 0.121), but it was not significant

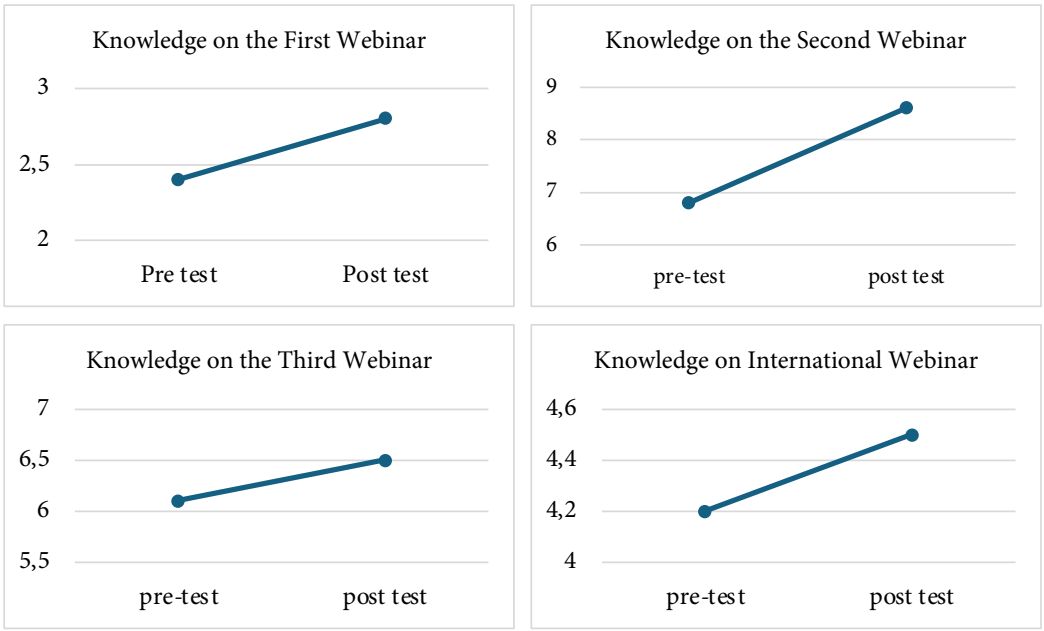

Figure 2. Knowledge Improvement Before and After the Nutrecent Webinar Series (n_1=28; n_2=5; n_3=10) and International Webinar Series (n=591)

as shown in Figure 2. The third series was attended by 26 participants, which included 81% female and 65% class XII from East Kalimantan and beyond. However, they were dominated by East Kalimantan students with 35% from Samarinda and 23% from Bontang, while only 3.8% came from Bima, West Kutai, Balikpapan, and Nunukan. Before the webinar, 65% of the participants had a good knowledge of Processed Food Exploration from Tropical rainforests.

Subsequently, knowledge improvement analysis was carried out on 10 participants (39%) who took the pre-test and post-test. The decrease in participation was due to the assignment's burdensome nature, which involved 3 hours of independent learning. The analysis results showed that all students had a good knowledge improvement, but it was not significant (p-value = 0.081). Meanwhile, before the third webinar, the average knowledge of participants was 6.1 with a standard deviation of 1.7, but after the webinar, the average knowledge increased to 6.5 with a standard deviation of 0.7 as shown in Figure 2.

The Nutrecent Webinar series was conducted three times for senior high school students, and there was no significant knowledge improvement from the three activities (p-value > 0.05). Furthermore, online learning activities were not appropriate for senior high school students when carried out weekly due to boredom, leading to an approximately 79% decrease in participation from 70 students in the first webinar to 15 in the second. Also, giving assignments that involve independent learning after the webinar is burdensome, and this contributed to poor participation. Therefore, it was not advisable to organize webinars during weekends and give assignments in the form of self-study. It was also advisable to include online learning in the school curriculum to increase the student's participation in the lesson because it impacts the final grade. To the researcher's knowledge, this was the first time the Nutrecent webinar series was conducted for senior high school adolescents, hence, it was necessary to design more exciting and interactive learning.

Similarly, the absence of a significant knowledge improvement in webinars also occurred in a previous study targeting senior high school adolescents about online Alzheimer's education in Los Angeles, 2019 (Saif *et al.*, 2020). This is consistent with a previous study on 791 school students in India, concluding that face-to-face learning is more effective than online webinars in health education (Deokar *et*

al., 2021). Therefore, it was advisable to increase the knowledge of senior high school students on the importance of consuming vegetables and fruit through physical classes by following strict health protocols. Distant learning with online media such as Zoom meetings was carried out due to the continuous mutation of COVID-19, consequently, everyone needs to be prepared for variants of the virus. Based on the results, senior high school adolescents were not suitable for online learning. Also, the importance of consuming vegetables and fruit should be included in the school curriculum to increase the student's knowledge.

After evaluating the Nutrecent Webinar Series activities, which had a low turnout from senior high school adolescents, an international webinar was held in collaboration with the Faculty of Public Health, Mulawarman University. The event had 929 participants from Indonesia and other countries such as Malaysia, Thailand, Belgium, and the Netherlands, though, only 654 people from the Zoom meeting took the tests. However, participants who joined the webinar through YouTube did not fill out the pre-test because it was given during webinar registration. The topic of the series was "Lifestyle and Mental Health", which was a current issue during the pandemic.

The speakers came from 2 universities, namely Dr. Nathalie Michels from Ghent University and Ratih Wirapuspita Wisnuwardani, Ph.D., from Mulawarman University. The first speaker spoke about lifestyle and mental health, stating that lifestyle is associated with the consumption of vegetables and fruit and degenerative diseases such as obesity, diabetes mellitus, kidney failure, and others. Meanwhile, the second speaker focused on consuming plant-based foods rich in polyphenols, especially processed foods from the Tropical rainforest in East Kalimantan and its association with the risk of degenerative diseases and mental health problems.

However, there was a 9.6% decrease in participants as only 591 out of the 654 participants filled the post-test. Most people came from Kalimantan, namely 81% from East Kalimantan and 9% from North Kalimantan. Also, there were participants from other countries, and 0.6% attended from Malaysia. There was a significant improvement during the international webinars (p-value < 0.001), where the average knowledge before the activity was 4.2 with a standard deviation of 0.8, and the average knowledge after the activity increased to 4.5 with a standard deviation of 0.8 as shown in Figure 2.

Based on the evaluation of the Nutrecent webinar series, which was unsuitable for senior high school adolescents, another webinar for college students, health workers, and the general public was conducted through a Zoom meeting. Furthermore, the new series presented international speakers and also provided SKP (participation credit unit) to participants as an attraction for this activity, consequently, there was an increase in the number of active participants. A study on college students in Los Angeles also concluded that knowledge improvement in Alzheimer's online learning is more effective for college students than senior high school students (Saif *et al.*, 2020). Furthermore, knowledge improvement in health education for college students also occurred in Australia (Green *et al.*, 2018)exercise physiology (EP, Amherst (USA) (Chung & Chen, 2020), and the UK (Nadama *et al.*, 2019; Cooper *et al.*, 2021). Based on previous studies and the International Nutrecent Webinar, online learning was only effective for college students and adults in the field of expertise. Meanwhile, independent learning was influenced by the readiness of the participant to learn.

Conclusion

The series of Nutrecent webinars for senior high school adolescents did not increase knowledge significantly (p-value > 0.05). In contrast, the international webinar for college students, health workers, and the general public significantly increased knowledge (p-value <0.001). Nuterecent was a digital learning platform for Indonesian adolescents, especially in East Kalimantan used social media such as Instagram, TikTok, and YouTube to promote the importance of consuming plant-based foods containing polyphenols such as vegetables and fruit by diversifying processed foods in Tropical rainforests. This study recommended face-to-face learning to promote vegetable and fruit

consumption in senior high school students to improve knowledge, attitudes, and behavior. Additionally, online webinars during the pandemic were suitable for college students and adults with previous knowledge of the webinar topic, such as health professionals.

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