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Unveiling the facilitators and barriers of adopting healthy diets among Indonesian teenagers during covid-19 pandemic

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Abstract

Background: The COVID-19 pandemic has prompted shifts in dietary habits among Indonesian teenagers, with some embracing healthier choices while others succumb to unhealthy options, especially during confinement. Identifying the factors influencing these dietary changes is essential for crafting effective interventions to promote better nutrition during this challenging time. This study aimed to determine the factors facilitating teenagers' shift to healthy, well-balanced diets.

Methods: A cross-sectional study enrolled 396 teenagers aged 15-17 in Surabaya and Sidoarjo, Indonesia was conducted in the second wave of COVID-19 pandemic. A self-administered questionnaire was distributed using an online survey platform. Nutrition literacy was assessed through health literacy measures related to adolescents' nutrition and diet. Predictors of the outcome were determined by logistic regression analysis.

Results: The results showed low economic status, comorbidities, and COVID-19 modules significantly predicted the shift to healthy diets. After adjusted analysis, only low economic levels (OR 0.30, 95% CI [0.13-0.70], p<0.05) and comorbidities (OR 0.33, 95% CI [0.12-0.93], p<0.05) were independent barriers against teenagers shifting to healthy diets, while choosing food without preservatives (OR 2.22, 95% CI [1.18-4.16], p<0.05) and maintaining body weight (OR 3.04, 95% CI [1.79-5.16], p<0.05) independently facilitated it.

Conclusion: The strategic actions aimed at improving dietary practices and nutrition literacy in teenagers should be designed to narrow the socioeconomic gap.

Keywords: Adolescents, Equality, Healthy Diet, Nutrition Literacy, Socioeconomic Gap, Indonesia

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Background

The COVID-19 pandemic has reshaped many aspects of human lives, including health-related lifestyles [1]. Evidence suggests increases in unhealthy habits, particularly during the implementation of public activity confinement when people did all daily activities at home, exposing them to a sedentary lifestyle [2]. Several studies reported unfavorable changes in dietary habits, including increased consumption of fast food and high-sugar food or beverages [3,4]. Dietary habits were associated with health-related quality of life among children and adolescents during the COVID-19 lockdown in Brazil and Spain [5]. Indonesian studies reported a drastic increase in food interest on calorie-dense carbohydrate-based foods during the period of government-issued restriction [6]. This contrary to Indonesian Ministry of Health recommendation for maintaining a healthy, well-balanced diet to increase immunity against coronavirus [7]. This is because the associations between healthy diets with reduced risks of COVID-19 severity [8]. On the other hand, an increase in unhealthy dietary habits during the COVID-19 outbreak has raised the prevalence of obesity, especially in the children population [9]. Nutrition literacy refers to people's capacity to access, interpret, and use nutrition information. Nutrition literacy emphasizes knowledge and behavior change in that this capacity would encourage people to prefer healthy diets.[10] A study on Turkish adolescents indicated nutrition literacy as a predictor of dietary habits [11]. Similarly, a survey of young adults showed an association between nutrition literacy scores and adolescent food habit checklist scores [12]. Teenagers aged 15-17 are under cognitive, emotional, and social developmental milestones within the transitioning phase into adulthood. They begin to develop autonomy with preferential choices on a reasoning basis, responsibility, and concerns about their physical appearance and future matters [13]. The World Health Organization has launched Global Accelerated Action for

the Health of Adolescents (AA-HA!), mandating countries worldwide to incorporate investment in adolescent health and well-being to achieve sustainable development goals [14]. This necessarily applies to nutrition matters, in that dietary habits developed early in life will greatly determine present and future health conditions and be carried into adulthood [15]. To our knowledge, there is a gap regarding the limited number of studies carried out on Indonesian teenagers' diet habits during COVID-19. Therefore, this study aims to reveal any factors that facilitate or against teenagers' shifting to healthy, well-balanced diets. It was hypothesized that sociodemographic factors, nutrition literacy, presence of comorbidities, having close relatives as medical personnel, having a medical history of COVID-19 infection, and viewing COVID-19 online modules at school were among the predictive factors.

Methods

Study design

This was an observational analytic study implementing a cross-sectional design. The high school students aged 15-17, living in Surabaya and Sidoarjo, Indonesia, were recruited. The research was conducted in August 2021 during the implementation of limited face-to-face learning for school students. This study used primary data collected by an online questionnaire instrument disseminated to the students through instructors at five high schools. This study analyzed the factors influencing a student's preference for a healthy, well-balanced diet, popularly termed "fill my plate," according to the Indonesian Ministry of Health [16].

Sampling technique

Five high schools were selected for convenience. The sampling technique was carried out using the consecutive sampling method.

Data Collection

An online questionnaire was developed and distributed according to the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) principles, using an online survey platform https://app.surveyplanet.com/. The students participated voluntarily, and anonymity was ensured. They were provided with an explanation of the survey's objectives and the consent information on the first page. They were required to click the BEGIN button as a sign of consent before they proceeded to the survey.

Sample size

The sample size was calculated (http://www.raosoft.com/samplesize.html) considering a 5% margin of error and 95% confidence. Thus, the minimum sample size was 377. The school principals were asked to consent to the recruitment of the students after being given information about the study objectives, study protocol, and questionnaire items.

Inclusion and exclusion criteria

The population of this study was high school teenagers (15-17 years) living in Surabaya and Sidoarjo, East Java, Indonesia. The inclusion criteria were high school students registered in public and private schools located in Surabaya and Sidoarjo, aged 15-17, who consented to participate in this study. Students who had an acute physical illness and/or mental problem, who tested positive for COVID-19 (either having symptomatic or asymptomatic illness), or who were self-quarantined due to COVID-19 suspicious contact were excluded from this study.

Variables

The sociodemographic variables collected include age, gender, school major, perceived economic status, and parental education. They were also asked whether they have close relatives as medical personnel, COVID-19-related comorbidities, history of COVID-19 infection, and presentation of online COVID-19 module at school or not. The comorbidities included heart disease, diabetes, asthma/allergy, tuberculosis, obesity, autoimmune disease, and cancer. The COVID-19 modules were assigned by instructors of each high school that contained information about how to stay healthy during the COVID-19 pandemic era. Several questions intended to assess students' capabilities to understand and apply nutritional information were adopted from items, which were parts of health literacy measures of adolescents (HELMA) [17], translated into Indonesian by three physician researchers proficient in English and Indonesian.

Statistical analysis

Analysis was performed using IBM SPSS statistics ver.23 software. The dependent variable was a healthy, well-balanced diet. The chi-square or fisher exact test compared each independent variable to the dependent variable. Binary logistic regression was used to show the predictive values of independent variables to the presence of outcome. Adjusted analysis was performed using a multivariate logistic regression test. All analyses were performed at a significance level of $p < 0.05$ with a 95% confidence interval.

Results

Characteristics of study participant

A total of 396 high school teenagers visited the informed consent page. All of them completed questionnaires. The completion rate was 100%. All responses were valid for further analyses. The number of participants aged 17 (49.0%) was balanced with those under 17 years (51.0%), with males outnumbered by females (38.1% vs 61.9%). Most participants were of natural sciences major (95.7%) and reported average-high perceived economic status (91.4%). Parental education was approximately balanced between those having fathers (52.3%) and mothers (47.5%) holding bachelor's degrees or above and those whose fathers (47.6%) and mothers (52.5%) have lower education backgrounds. Only 5.1% of participants had close relatives as medical personnel and 5.1% had comorbidities. There were 122 participants (30.8%) who reported having a history of COVID-19 infection, and 276 participants (69.7%) learning online COVID-19 modules at school. The proportion of participants of low economic status who shifted to healthy, well-balanced diets during the COVID-19 pandemic was significantly lower than those of higher economic status ($p<.05$). The proportion of participants having comorbidities (predominantly obesity) reported shifting their dietary habits into the healthy one was also significantly lower than those without comorbidities ($p<.05$). Furthermore, presentation of online COVID-19 modules was significantly associated with shifting to healthy well-balanced diet ($p<.05$) (Table 1).

Table 1: Characteristics of study participants (n=396)

Characteristics	Healthy Balanced Diet (n = 296, 75%)	Not Healthy Balanced Diet (n = 100, 25%)	p-value
Age (15-17), n [%]			0.489
Age = 17 years	148 (76.3%)	46 (23.7%)	
Age < 17 years	148 (73.3%)	54 (26.7%)	
Gender, n [%]			0.246
Male	108 (71.5%)	43 (28.5%)	
Female	188 (76.7%)	57 (23.3%)	
School major, n [%]			0.775[f]
Natural sciences	284 (74.9%)	95 (25.1%)	
Social sciences	12 (70.6%)	5 (29.4%)	
Economic status, n [%]			0.001*
Low	17 (50.0%)	17 (50%)	
Average-High	279 (77.1%)	83 (22.9%)	
Father education, n [%]			0.599
Bachelor's degree or above	157 (75.8%)	50 (24.2%)	
Senior high school or below	139 (73.6%)	50 (26.4%)	
Mother education, n [%]			0.421
Bachelor's degree or above	144 (76.6%)	44 (23.4%)	
Senior high school or below	152 (73.1%)	56 (26.9%)	
Close relative as medical personnel, n [%]			0.107
Yes	18 (90.0%)	2 (10.0%)	
No.	278 (73.9%)	98 (26.1%)	
Having comorbidities, n [%]			0.037*
Yes	11 (55.0%)	9 (45.0%)	
No	285 (75.8%)	91 (24.2%)	
Having a COVID-19 infection history, n [%]			0.840
Yes	92 (75.4%)	30 (24.6%)	
No	204 (74.4%)	70 (25.6%)	
Having a COVID-19 module, n [%]			0.015*
Yes	216 (78.2%)	60 (21.8%)	
No	80 (66.7%)	40 (33.3%)	

* p-value < 0.05, Chi-square, fisher exact test

Nutrition literacy

The ability to access information about healthy diets, read educational brochures about nutritional issues, and appraise the validity of nutritional information were significantly associated with shifting to healthy well-balanced diets (p<.05). In addition, teenagers' abilities to apply the information, in regard with choosing food based on its nutrition facts written on the packaging when shopping and choosing food without preservatives were also significantly associated to a greater number of teenagers who were prone to healthy diets during COVID-19-related confinement (p<.05). Similar association was also found between maintaining body weight with healthy diets (p<.05). Nonetheless, the abilities to understand nutritional information and to calculate and assess nutritional content and body mass index (BMI) were not associated with shifting into healthy well-balanced diet among the teenagers (p>.05) (Table 2).

Logistic regression analysis

Bivariate analysis identified perceived low economic status (COR 0.30, [0.15-0.61], p<.05) and presence of comorbidities (COR 0.40, [0.16-0.98], p<.05) to be the factors against the teenagers to shift into healthy diets as recommended by the government to enhance immune system during the COVID-19 pandemic. Factors facilitating teenagers' shifting to healthy diets include the presentation of online COVID-19 modules at school, the ability to access information about healthy diets, the ability to read educational brochures about nutritional information, and the ability to choose the correct nutritional information. Their practices of choosing food based on nutrition facts, choosing food without preservatives, and maintaining body weight also predicted shifting to healthy diets among high school teenagers (Table 3). Multivariate analysis was performed on all variables to look for factors that independently affect the healthy balanced diet. The Omnibus Tests (<0.001) and the Hosmer and Lemeshow tests (0.242) showed that the analytical model formed was fit to the data. The overall percentage showed the model precision of 78%. After being adjusted, perceived low economic status and comorbidities were still found to be the hurdles against shifting to healthy, well-balanced diets among teenagers (AOR 0.30, [0.13-0.70], and 0.33, [0.12-0.93] p<0.05). Choosing food without preservatives (AOR 2.22, [1.18-4.16], p<0.05) and maintaining body weight proportionately with height (AOR 3.04, [1.79-5.16], p<0.05) were the facilitating factors for the teenagers to shift to healthy well-balanced diets (Table 3).

Table 2. Answers to nutritional and diet questionnaire

Items of HELMA related to nutrition literacy	Healthy Balanced Diet (n = 296, 75%)	Not Healthy Balanced Diet (n = 100, 25%)	p-value
I am able to access information about the healthy diet that is appropriate for my age group			0.026*
Yes	123 (80.9%)	29 (19.1%)	
No.	173 (70.9%)	71 (29.1%)	
I can easily read educational brochures about nutritional issues			0.012*
Yes	134 (81.2%)	31 (18.8%)	
No.	162 (70.1%)	69 (29.9%)	
I can easily understand the nutrition facts on food packages			0.131
Yes	162 (77.9%)	46 (22.1%)	
No.	134 (71.3%)	54 (28.7%)	
I can understand the information and recommendations about proper nutrition for adolescents in the media			0.357
Yes	187 (76.3%)	58 (23.7%)	
No.	109 (72.2%)	42 (27.8%)	
When dealing with nutritional information, I can choose the correct information			0.002*
Yes	154 (81.9%)	34 (18.1%)	
No.	142 (68.3%)	66 (31.7%)	
When shopping, I choose food based on its nutrition facts written on the packaging			<0.001*
Yes	86 (88.6%)	11 (11.4%)	
No.	210 (70.2%)	89 (29.8%)	
I try to choose foods without preservatives			<0.001*
Yes	125 (86.2%)	20 (13.8%)	
No.	171 (68.1%)	80 (31.9%)	
I try to keep my body weight in balance			<0.001*
Yes	192 (85.3%)	33 (14.7%)	
No.	104 (60.8%)	67 (39.2%)	
Calculate calories from nutritional facts			0.809
Correct	270 (74.6%)	92 (25.4%)	
Incorrect	26 (76.5%)	8 (23.5%)	
Calculate BMI			0.901
Correct	159 (75.0%)	53 (25.0%)	
Incorrect	137 (74.4%)	47 (25.6%)	
Identify BMI category			0.257
Correct	199 (76.5%)	61 (23.5%)	
Incorrect	97 (71.3%)	39 (28.7%)	

*p-value < .05, Chi-Square, BMI= body mass index

Discussion

Three-quarters of high school teenagers reported shifting to healthy, well-balanced diets during the COVID-19 outbreak, higher than the 46% reported among Indonesian adults [18]. Teenagers from low economic backgrounds and those with comorbidities were less likely to shift to healthy diets. The presentation of online COVID-19 modules at school and competencies related to nutrition literacy were associated with this shift. Further analyses identified low perceived economic levels and comorbidities as barriers, while predictors included accessing information about healthy diets, reading educational brochures, choosing correct nutritional information, selecting food based on nutrition facts, avoiding preservatives, and maintaining balanced body weight. After adjusted analysis, only avoiding preservatives, and maintaining balanced body weight remained significant predictors, with those individuals being approximately 2 to 3 times more likely to adopt healthy diets. Age, gender, school major, parental education, having close relatives as medical personnel, and having a history of COVID-19 infection did not significantly influence dietary changes. The findings of this study have confirmed that the low economic group, including the teenager population, suffered from heightened impacts of COVID-19 and related restrictive measures. The COVID-19 pandemic posited financial and health crises that impacted food security and, thus, diet quality, raising concerns about long-term impacts on access to and affordability of nutrient-rich, healthy diets and their health implications on financially vulnerable people [19].

Table 3. Logistic binary regression

Variables	COR	p-value	AOR	p-value
Age = 17 years	1.18 (0.75-1.85)	0.490	1.51 (0.87-2.59)	0.145
Male	0.77 (0.49-1.21)	0.247	0.77 (0.45-1.34)	0.353
Natural sciences	1.25 (0.43-3.63)	0.688	1.09 (0.32-3.73)	0.899
Low economy	0.30 (0.15-0.61)	0.001*	0.30 (0.13-0.70)	0.006*
Father's high degree	1.13 (0.72-1.78)	0.599	1.14 (0.62-2.11)	0.690
Mother's high degree	1.21 (0.77-1.91)	0.422	0.95 (0.49-1.81)	0.854
Close med personnel	3.18 (0.73-13.93)	0.126	3.51 (0.72-17.15)	0.122
Having comorbidities	0.40 (0.16-0.98)	0.044*	0.33 (0.12-0.93)	0.036*
COVID-19 history	1.06 (0.65-1.73)	0.84	0.99 (0.55-1.78)	0.955
COVID-19 module	1.80 (1.12-2.90)	0.016*	1.61 (0.94-2.76)	0.086
Access information about healthy diet	1.75 (1.07-2.85)	0.027*	1.17 (0.64-2.15)	0.617
Read educational brochures about nutritional issues	1.85 (1.14-2.99)	0.013*	1.42 (0.76-2.68)	0.283
Understand the nutrition facts on food packages	1.42 (0.91-2.24)	0.132	0.76 (0.40-1.44)	0.389
Understand the nutrition recommendations in the media	1.25 (0.79-1.98)	0.358	0.75 (0.40-1.41)	0.364
Choose the correct nutritional information	2.11 (1.32-3.38)	0.003*	1.45 (0.78-2.68)	0.247
Choose food based on its nutrition facts	3.32 (1.69-6.51)	0.001*	2.04 (0.93-4.48)	0.077
Choose foods without preservatives	2.93 (1.71-5.03)	0.001*	2.22 (1.18-4.16)	0.014*
Keep body weight in balance	3.75 (2.32-6.06)	0.001*	3.04 (1.79-5.16)	0.001*
Correctly calculate calories from nutritional facts	0.91 (0.40-2.07)	0.809	0.92 (0.35-2.40)	0.853
Correctly calculate BMI	1.03 (0.66-1.63)	0.902	0.67 (0.35-1.30)	0.233
Correctly identify the BMI category	1.32 (0.83-2.10)	0.258	1.60 (0.83-3.07)	0.162

AOR: adjusted odds ratio; COR: crude odds ratio; * p-value < .05. BMI=body mass index; Close med personnel= Having close relatives who were medical personnel; High degree=bachelor's degree and above

Discussion

Three-quarters of high school teenagers reported shifting to healthy, well-balanced diets during the COVID-19 outbreak, higher than the 46% reported among Indonesian adults [18]. Teenagers from low economic backgrounds and those with comorbidities were less likely to shift to healthy diets. The presentation of online COVID-19 modules at school and competencies related to nutrition literacy were associated with this shift. Further analyses identified low perceived economic levels and comorbidities as barriers, while predictors included accessing information about healthy diets, reading educational brochures, choosing correct nutritional information, selecting food based on nutrition facts, avoiding preservatives, and maintaining balanced body weight. After adjusted analysis, only avoiding preservatives, and maintaining balanced body weight remained significant predictors, with those individuals being approximately 2 to 3 times more likely to adopt healthy diets. Age, gender, school major, parental education, having close relatives as medical personnel, and having a history of COVID-19 infection did not significantly influence dietary changes. The findings of this study have confirmed that the low economic group, including the teenager population, suffered from heightened impacts of COVID-19 and related restrictive measures. The COVID-19 pandemic posited financial and health crises that impacted food security and, thus, diet quality, raising concerns about long-term impacts on access to and affordability of nutrient-rich, healthy diets and their health implications on financially vulnerable people [19]. Comorbidities reported by high school teenagers in this study were mostly obesity. Those with obesity should be of great concern. Obesity predisposes severity and mortality in young COVID-19 patients [22]. Therefore, obese people should readily shift their dietary habits into healthy ones to minimize these health risks. However, this study showed that obesity was instead a hurdle for teenagers to change to healthy, well-balanced diets. Several identified barriers to healthy eating among obese persons include lack of knowledge, lack of self-control or motivation, and lack of time [23]. In addition, obesity is associated with unhealthy food preferences. Obese persons have a lower taste sensitivity and a higher preference and intake of fat and, to a lesser extent, sweet food [24]. Biological explanation underpins different brain pathways in obese individuals compared to non-obese counterparts, discouraging them from eating a healthy diet [25]. Presentation of online COVID-19 modules at school was associated with shifting to healthy, well-balanced diets among high school teenagers, although no statistical significance was shown after adjusted analysis. The result of this study emphasized that schools' role in health education was sustained despite the circumstances of school closure. This was in line with several studies indicating the sustained actions of schools in promoting nutritional education during COVID-19-related confinement, utilizing innovative virtual teachings [26,27]. Our finding further highlighted the fact that the role of schools goes well beyond education to ensuring critical nutrition, health, and other services during the COVID-19 pandemic [14,28]. This study confirmed specific capacities of nutrition literacy as contributing factors for shifting to healthy, well-balanced diets among teenagers during the COVID-19 outbreak. Even though only the capacity to apply health information on practices of choosing food without preservatives and maintaining body weight in balance independently predicted the change in dietary habits after adjusted analysis. It has been argued whether nutrition literacy considerably impacts encouraging healthy diet behavior [29]. Food choice, eating behavior, and dietary intake/nutrition with their related factors define dietary behavior. The healthy, well-balanced diet recommended by the Indonesian

Ministry of Health refers to the concept of dietary intake that was interplayed with food choice and eating behavior, on which biological, emotional, social, and environmental backgrounds operate [30,31]. The result of this study was in concordance with a study on college students in Taiwan, which reported nutrition literacy as a predictor of healthy eating behavior. However, it should be considered that different instruments were used as our study did not measure a sum score of nutrition literacy [32]. Our result partly contravened a study on adolescents aged 14-19 carried out before the COVID-19 pandemic that did not find associations between scales of nutrition literacy and healthy eating except for the domain of macronutrient literacy. Regarding no association was found between food labels and numeracy domain with healthy eating agreed with our finding [33]. The findings of this study did not implicate gender as a factor for shifting to healthy diets among teenagers. A greater proportion of female teenagers reported the shift to healthy diets than males. However, it did not rise to statistical significance. Several studies demonstrated gender differences in food preference [34]. including in the context of dietary habit alteration during the COVID-19 lockdown [35]. This matter can be conceptualized within perspectives of biological sex and cultural gender differences. Women have a stronger belief in a healthy diet, are more engaged in controlling body weight, and often express dissatisfaction with their dietary practices, leading to their attempts to reduce eating-related pleasure. On the other hand, men are inclined to fatty meals with a strong taste and are directed mainly by the pleasure of food consumption [34]. These gender-based differences seemingly did not play essential parts in determining the diet changes among teenage participants in this study since males and females equally understood and perceived the importance of the recommended diet in maintaining their immunities and health during the COVID-19 outbreak. Having close relatives as medical personnel was expected to facilitate teenagers to healthy eating. The dietary habits of teenagers are inarguably influenced by family diet.[4] Medical practitioners were among the populations at highest risk for Coronavirus infection [36]. This fact was parallel with their high perceived COVID-19 risk score, which was also associated with increased adherence to preventive measures [37]. This was not necessarily consistent with their dietary behaviors. A study on healthcare professionals in 2021 documented that many healthcare professionals increased their carbohydrate consumption, with 14.3% increasing the consumption of sweets, 8.6% of fatty foods, and 19.5% of junk food [38]. A study before the COVID-19 pandemic comparing dietary views and habits between health-professional versus non-health-professional students concluded no significant difference between groups, implying that richer knowledge about nutrition among health-professional students did not necessarily reflect their better dietary views and practices [39]. Another study finding was that parental education, which likely implied their knowledge and ability to prepare healthy diets, did not influence teenagers to adopt healthy diets. A qualitative study on British mothers during lockdown revealed that despite having sufficient knowledge and motivation to prepare healthy food, they were challenged with difficult circumstances, being barriers to providing healthy diets for their families [4]. Past COVID-19 infection did not predispose teenagers to adopt healthy, well-balanced diets. A plausible explanation for this finding was that those with past COVID-19 infection perceived lower risks of getting reinfection and/or disease severity, likely due to a belief that they had possessed stronger active immunity [40]. To our knowledge, this was the first study reporting the change in dietary habits and its factors among teenagers during the COVID-19 pandemic and related confinement in Indonesia. This study portrayed subgroups of teenagers with low economic status and/or comorbidities, those among high-risk groups hit by a multitude of COVID-19 impacts, were also lagged in preferences for healthy diets compared to counterparts. In addition, we identified several areas of nutrition literacy as facilitators of shifting to healthy, well-balanced diets. With abundant worldwide reports showing an increase in obesity among children and adolescents during the COVID-19 pandemic, our key findings advocate intensified actions targeting teenagers' dietary behaviors and nutrition literacy as part of mitigation against the forthcoming obesity pandemic and investment in adolescent health as was mandated by WHO. These actions should also be intended to close socioeconomic gaps in health and nutrition among adolescents. This study had several limitations. Non-probability sampling possibly created samples that were not well-representative in this study, thereby complicating inference to the population. The self-administered online questionnaire was likely subjected to survey biases, although they were already addressed using a trusted survey platform. In addition, this study did not employ objective measurement of dietary intake. Therefore, further studies on more extensive and representative samples using an objective measure of diet were necessary.

Conclusion

The facilitators predisposing the teenagers to shift to a healthy, well-balanced diet during the COVID-19 pandemic were the practices of choosing food without preservatives and maintaining body weight, while the hurdles were low perceived economic levels and comorbidities. According to the analysis, other variables also contributed and deserve further study.

Abbreviation

AA-HA: Accelerated Action for the Health of Adolescents; CHERRIES: Checklist for Reporting Results of Internet E-Surveys

Declaration

Acknowledgment

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Availability of data and materials

Data will be available by emailing nurina-h@fk.unair.ac.id

Authors' contributions

Nurina Hasanatuludhhiyah (NH) conceived and designed the analysis; collected the data; contributed data or analysis tools; performed the analysis; and wrote the manuscript. Visuddho Visuddho (VV) contributed data or analysis tools; performed the analysis; wrote the manuscript. Annette d'Arqom (AdA), Ancah Caesarina Novi Marchianti (ACNM), and Farapti Farapti (FF) conceived and designed the analysis; collected the data; and wrote the manuscript. All authors read and approved the final manuscript.

Ethics approval and consent to participate

The research has obtained written permission and ethical eligibility from the Health Research Ethics Committee of the Faculty of Medicine, Universitas Airlangga Surabaya, Indonesia, with number 36/EC/KEPK/FKUA/2021. All procedures performed in this study were in accordance with the ethical standards of the institutional and national research committee and with the Helsinki Declaration.

Consent for publication

Not applicable

Competing interest

The authors declare that they have no competing interests.

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