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Prediction Model of Balanced Nutrition Practices among University Students in the COVID-19 Outbreak

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Abstract

AIM: Students included in the category of youth need balanced nutrition practices, especially during the COVID-19 outbreak. This study aims to determine the model of balanced nutrition behavior in youth in Gowa Regency, Makassar, Indonesia.

MATERIALS AND METHODS: This study was a quantitative study with a cross-sectional study, in which primary data were collected from June to July 2020. The respondents were 597 students at public and private universities located in Gowa Regency who filled the questionnaires.

RESULTS: The bivariate analysis results, which were based on the respondents' characteristics, showed that only age significantly affected balanced nutrition practices (p = 0.048). Based on the independent variables studied, poor knowledge (p = 0.000, OR_{crude} = 2.229 [CI 1.601–3.105]) and poor attitude (p = 0.001, OR_{crude} = 1.735 [CI 1.250-2.409]) obtained a significant correlation with poor balanced nutrition practices. The final model of balanced nutrition practices using multivariate analysis indicated that knowledge was the biggest predictor of balanced nutrition (p = 0.000, OR = 2.067 [CI 1.476–2.893]). The number implied that respondents with good knowledge had 2.067 times the opportunity to take balanced nutrition practices than those with less knowledge after controlling for age and attitude variables.

CONCLUSION: Producing well-balanced nutrition behavior requires well-balanced nutrition knowledge, including university students who belong to the late adolescent stage.

Introduction

Adolescence is the transitional age group from childhood to young adolescence and adulthood. Essential conditions that affect the nutritional needs of this group include rapid growth while entering the age of puberty, eating habits, menstruation, and the attention to the physical appearance of body image, especially in young women. Thus, the calculation of the nutritional needs, including balanced nutrition in this group, must pay attention to these conditions. For young women, notably, more attention should be paid to their preparation before marriage [1].

Students whose ages belong to the adolescence group are the same. Those with busy activities, such as lectures, work on assignments and exams, field activities, student activities, and other activities, require the fulfillment of balanced nutrition, specifically during the current COVID-19 outbreak. A prior study discovered that more than half of students had proper knowledge related to balanced nutrition, however, only a tiny part of the sample applied a good consumption pattern with rice, chicken, and coconut oil as the types of food ingredients that are often consumed [2]. Students also eating more during the pandemic, increased consumption of snacks, and increased consumption of vegetables and fruit [3], [4].

Knowledge affects behavior change by providing a favorable understanding and great trust in the information obtained so that the subject's behavior can shift through changes in their attitudes [5], [6]. However, this is not always the case. Several studies have shown that knowledge influences shifting in eating behavior regardless attitudes being change [7], [8]. On the other hand, attitudes are related to changes in behavior without being accompanied by a relationship between knowledge and behavior [9], [10].

Based on the background elucidated above, it can be argued that the predictive model for balanced nutrition of students during the COVID-19 outbreak should be studied to provide more information on students' balanced nutritional behavior.

Methods

This study is a quantitative study with a cross-sectional design, in which primary data were collected from June to July 2020. The data were collected through an online questionnaire distributed through WhatsApp from June 17 to July 19, 2020. The respondents were students of public and private universities in Gowa Regency, Makassar, Indonesia, with informed consent describing a refusal to be a resident respondent as the exclusion criteria. In total, students who filled the questionnaire were 597, while three respondents were excluded. In other words, it can be stated that the total sample was 597 residents from seven universities in Gowa Regency.

The online questionnaire consisted of four parts, namely demographic characteristics, knowledge, attitudes, and practices of balanced nutrition. The time to answer the online questionnaire is a maximum of 20 min. The respondents' answers were first scored before being analyzed. It was then accumulated to determine the cut-off point through the mean value. Knowledge, attitude, and practice variables in this study were divided into 2 categories. Respondents who answered correctly 50% of the number of questions on the questionnaire were included in the "poor" category, while respondents who answered correctly >50% of the total questions were included in the categories of "good" knowledge, attitude, and practice.

The independent variables of this study were knowledge and attitude toward balanced nutrition, while the practice of balanced nutrition was the dependent variable. The demographic variable, moreover, was supposed to be a potential confounder variable; however, it was according to the final model after the multivariate analysis had been done. The data were analyzed through frequency for the univariate analysis, chi-square for the bivariate analysis, and logistic regression for the multivariate analysis to find the final model correlation of knowledge toward the practice of preventive action among students after controlling the potential confounder variable.

Results

The sample was 597 productive people, primarily female (86.8%), age >21 (63.8%), with the average family income above or equal to the minimum wage (52.4%). Besides, during the pandemic, most of them live together with their parents (75.4%) or siblings (54.3%). Based on the information on balanced nutrition, the most respondents were identified with good knowledge (54.4%), attitudes (54.1%), and practices (57.6%), which can be further seen in the Table 1.

Table 1: Frequency distribution of demographic characteristics, knowledge, attitudes, and practices related to balanced nutrition (n = 597)

Variables	n	%
Sex		
Male	79	13.2
Female	518	86.8
Age (years old)		
15–21	216	36.2
>21	381	63.8
Father's education		
≤Junior high school	152	25.5
>Junior high school	445	74.5
Mother's education		
≤Junior high school	167	28.0
>Junior high school	430	72.0
Father's occupation		
Farmer/laborer	194	32.5
Self-employed	248	41.5
Civil servant	155	26.0
Mother's occupation		
Housewife	395	66.2
Farmer/laborer	9	1.5
Self-employed	64	10.7
Civil servant	129	21.6
Family income (per month)		
<Regional Minimum Wage (UMR)	284	47.6
≥Regional Minimum Wage (UMR)	313	52.4
Who do you live with during the pandemic		
Rented house	33	5.5
Family	114	19.1
Parents	450	75.4
Number of siblings (people)		
>3	324	54.3
≤2	273	45.7
Breakfast habits per week (times)		
>3	216	36.2
0–3	381	63.8
Lunch habits per week (times)		
>3	291	48,7
0–3	306	51.3
Dinner habits per week		
>3 times	275	46.1
0-3 times	322	53.9
Snack consumption (times/week)		
>3	344	57.6
≤3	253	42.4
What order are you in the family		
>2	179	30.0
2	160	26.8
1	258	43.2
Balanced nutrition knowledge		
Poor	272	45.6
Good	325	54.4
Balanced nutrition attitude		
Poor	274	45.9
Good	323	54.1
Balanced nutrition practices		
Poor	253	42.4
Good	344	57.6

Characteristics of respondents based on balanced nutrition practices

The results showed that only age significantly affected the balanced nutrition practices (p = 0.048), while other demographic aspects were insignificant, as shown in Table 2.

Knowledge and attitude toward balanced nutrition practices

The bivariate analysis indicated that knowledge (p = 0.000) and attitude (p = 0.001) brought a significant effect on balanced nutrition practices (Table 3).

Final models of balanced nutrition practice

The results of the multivariate analysis on knowledge as a variable disclosed that the most

Table 2: Demographic characteristics and practices related to balanced nutrition (n = 597)

Characteristics	Practice				OR_{crude} (95% CI)	p-value
	Poor		Good			
	n	%	n	%		
Sex						
Male	30	38.0	49	62.0	0.810(0.498–1.317)	0.395
Female	223	43.1	295	56.9	1	
Age (years old)						
15–21	103	47.7	113	52.3	1.404(1.002–1.966)	0.048
>21	150	39.4	231	60.6	1	
Father's education						
≤Junior high school	65	42.8	87	57.2	1.021(0.704–1.482)	0.912
>Junior high school	188	42.2	257	57.8	1	
Mother's education						
≤Junior high school	77	46.1	90	53.9	1.235(0.862–1.770)	0.251
>Junior high school	176	40.9	254	59.1	1	
Father's occupation						
Farmer/laborer	87	44.8	107	55.2	1.287(0.838–1.978)	0.509
Self–employed	106	42.7	142	57.3	1.182(0.785–1.780)	
Civil servant	60	38.7	95	61.3	1	
Mother's occupation						
Housewife	166	42.0	229	58.0	0.975(0.652–1.458)	0.908
Farmer/laborer	3	33.3	6	66.7	0.673(0.161–2.809)	
Self–employed	29	45.3	35	54.7	1.115(0.610–2.038)	
Civil servant	55	42.6	74	57.4	1	
Family income (monthly)						
<UMR	114	40.1	170	59.9	0.839(0.606–1.162)	0.292
≥UMR	139	44.4	174	55.6	1	
Who do you live with during the pandemic						
Rented house	19	57.6	14	42.4	0.519	0.190
Family	48	42.1	66	57.9	0.969	
Parents	186	41.3	264	58.7	1	
Number of siblings (people)						
>3	110	40.3	163	59.7	0.854(0.616–1.184)	0.344
≤2	143	44.1	181	55.9	1	
What order are you in the family						
>2	81	45.3	98	54.7	1.926(0.942–3.939)	0.605
2	64	40.0	96	60.0	1.032(0.681–1.566)	
1	108	41.9	150	58.1	1	
Breakfast habits per week (times)						
>3	82	38.0	134	62.0	0.752(0.534–1.057)	0.100
0–3	171	44.9	210	55.1	1	
Lunch habits per week (times)						
>3	118	40.5	173	59.5	0.864(0.624–1.196)	0.378
0–3	135	44.1	171	55.9	1	
Dinner habits per week (times)						
>3	117	42.5	158	57.5	1.013(0.731–1.403)	0.939
0–3	136	42.2	186	57.8	1	
Snack consumption (times/week)						
>3	151	43.9	193	56.1	1.158(0.833–1.610)	0.382
≤3	102	40.3	151	59.7	1	

significant predictor factor for balanced nutrition practices was OR (95% CI) = 1.354 (1.476–2.893) with p = 0.000. The number further indicated that respondents with good knowledge had 2.067 times the opportunity to carry out balanced nutrition practices than respondents with less knowledge after being controlled with age and attitude variables.

Table 3: Knowledge and attitude toward balanced nutrition practices using Chi-square (n = 597)

Variable	Practice				OR_{crude} (95% CI)	p-value
	Poor		Good			
	n	%	n	%		
Knowledge						
Poor	114	52.9	128	47.1	2.229 (1.601–3.105)	0.000
Good	109	33.5	216	66.5		
Attitude						
Poor	136	49.6	138	50.4	1.735 (1.250–2.409)	0.001
Good	117	36.2	206	63.8		

The other multivariate analysis performed on attitude also showed predictor factors for balanced nutrition practices of OR (95% CI) = 1.600 (1.143–2.240) with p = 0.006. In other words, it can be argued that respondents with good attitudes had 1.600 times the opportunity to take balanced nutrition practices than respondents whose attitudes were less after being controlled with age and knowledge variables. As for those that showed predictor factors for balanced nutrition practices, the OR is (95% CI) = 1.358 (0.960–1920) with p = 0.084, which pointed out that respondents aging more than 21 years old had 1.358 times the opportunity to take balanced nutrition practices compared to respondents aging 15–21 years old after being controlled with attitude and knowledge variables (Table 4).

Discussion

Balanced nutrition practices

The balanced nutrition practice is a practice that includes a diet with components of vegetables, fruit, vegetable protein, and animal protein, which is under the pillars of balanced nutrition. Balanced nutrition practices questions also include the consumption of sweet, salty, and fatty foods, physical activity patterns, and handwashing behavior before eating under the balanced nutrition guidelines during the COVID-19 outbreak. Based on the analysis, this study discovered that teenagers with good practices toward balanced nutrition were as much as 57.6%, which proved that most teenagers already know that balanced nutrition practices are indispensable in maintaining body

Table 4: Full and final predictive models of balanced nutrition practice

Variable	Full model		Final model		Coefficient (B)	S.E
	Adjusted OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value		
Age (years old)						
15–21	1.383 (0.976–1.960	0.068	1.358 (0.960–1.920)	0.084	0.306	0.177
>21	1		1			
Attitude						
Poor	1.591 (1.135–2.230)	0.007	1.600 (1.143–2.240)	0.006	0.470	0.172
Good	1		1			
Knowledge						
Poor	2.018 (1.439–2.831)	0.000	2.067 (1.476–2.893)	0.000	0.726	0.172
Good	1					
Breakfast Habits per week (times)						
>3	0.792 (0.556–1.128)	0.196	-	-	-	-
0–3	1					
Who do you live with during the pandemic						
Rented house Family	1.741 (0.832–3.642)	0.141	-	-	-	-
Parent	1.011 (0.657–1.555)	0.961				
Constanta	1				-0.981	0.153

immunity, especially during the COVID-19 outbreak. Furthermore, consuming foods with balanced and safe nutrition can improve the immune system and reduce the risk of chronic diseases and infectious diseases [11].

Even so, many adolescents have not implemented a well-balanced diet due to several factors, such as living alone in a boarding house so that the application of balanced nutrition is not well-maintained. Maintaining a good and healthy diet is vital during pandemics, including COVID-19. Although no food or dietary supplement can prevent coronavirus transmission, changing diet by consuming a healthy, balanced diet is essential in increasing an excellent immune system [12].

Predictive modeling of balanced nutrition practices

The final predictive modeling demonstrated that the predictors of balanced nutrition practices in adolescents during the COVID-19 outbreak were age, knowledge, and attitudes related to the application of balanced nutrition.

The formula for the predictive model of Balanced Nutrition Practice use regresion equation is as follow:

y = constant + b1x1+b2x2+….+bixi

The logit model for balanced nutrition practice = –0.981 + 0.306* age + 0.47* attitude + 0.726* Knowledge. If a 15–21 year old, has a poor attitude and knowledge, the prediction of probability that individu have the poor balanced nutrition practice is

$$In\left(\frac{p}{1-p}\right) = a + b_1 x_1 + b_2 x_2 + \ldots\ldots\ldots\ldots + b_k x_k$$

$$P = \frac{1}{1+\exp^{-(y)}}$$

$$P = \frac{1}{1+\exp^{-(0.521)}}$$

$$P = \frac{1}{1.594}$$

P = 0.627 or 62.7%

The formulated model stipulated that if all predictors were “Yes = 1,” it could predict a 62.7%, which means that the predictor variable had a high contribution in predicting the outcome, namely balanced nutrition practices.

Knowledge of balanced nutrition will determine attitudes and practices related to the application of balanced nutrition, especially during the COVID-19 outbreak, which requires maximum prevention. One of the preventions, moreover, can be done by consuming a balanced diet. Most of the teenagers who were the sample of this study had good knowledge about balanced nutrition and implementing balanced nutrition practices. Thus, the results showed a significant relationship between adolescent knowledge and balanced nutrition practices during the COVID-19 outbreak.

OR value of knowledge is higher than attitudes related to balanced nutrition practices in this research. The student proportion of poor knowledge and practices is higher than student proportion of poor attitudes and practices. The proportion of student with good knowledge and practices is also higher than student who have good attitudes and practices. Good knowledge of balanced nutrition in this study aligns with the previous research [13]. Excellent knowledge,

furthermore, is the main thing in determining the selection of foods according to balanced nutrition. In other words, by having good knowledge about healthy food, adolescents know more about arranging a healthy food menu and thereby can regulate their diet in various ways and accordance with balanced nutrition guidelines. This way, immunity can be maintained, and the body is protected from infectious diseases [14].

The final multivariate model, however, did not include the sex, parents' education and occupation, family income, living status, number of siblings, breakfast habits, lunch habits, dinner habits, and snack consumption.

Factors associated with balanced nutrition practices

The age and attitude of adolescents toward the application of balanced nutrition are predictors in addition to the knowledge related to balanced nutrition practices. In addition, adolescents aged 15–21 years old have a higher percentage of implementing poorly balanced nutrition (47.7%) than adolescents aged >21 years old. In contrast, adolescents aged >21 years old had a higher percentage of well-balanced nutrition (60.6%) than adolescents aged 15–21 years old. Teenagers are generally still unstable and easily influenced – the knowledge they have cannot simply be applied in their daily lives due to the influence of friends, family, and the environment [15]. Age in this study, moreover, has a positive relationship with balanced nutrition, where the older the age, the more proportional the balanced nutrition practice [16].

Based on balanced nutrition practices, adolescents who have poor attitudes also had poor balanced nutrition practices. The percentage of adolescents with poor attitudes and practices was 49.6%, while those with good attitudes and practices toward well-balanced nutrition reached 63.8%. The attitude toward positive, balanced nutrition practices will result in positive practices and affect a person's nutritional status [17]. However, other study found that subjects had good behavior even though their knowledge was lacking and their attitudes were negative [18]. Person's behavior is not only influenced by knowledge and attitudes, which are predisposing factors for behavior changes, but also by enabling factors (availability of facilities and infrastructure) as well as reinforcing factors, such as the influence of community leaders and people who are considered necessary, namely health workers and other laws [19].

Conclusion

In conclusion, the age as a respondent's characteristic and the attitude and knowledge variables were predictors of balanced nutrition practices during the COVID-19 outbreak. Furthermore, age 15–21 and lack of attitude and knowledge were predictors of poorly balanced nutrition. These variables would arguably directly affect other variables such as breakfast, lunch, dinner habits, and snack consumption per week.

After analyzing all the mentioned variables, in the end, it can be confirmed that the final predictive modeling of balanced nutrition practices using multivariate analysis shows that knowledge is the most significant predictor of balanced nutrition. In other words, the respondents with good knowledge have 2.067 times the opportunity to carry out balanced nutrition practices than respondents with less knowledge after controlling age and attitude variables. Thus, good knowledge of balanced nutrition is also needed for adolescent students to produce good balanced nutritional behavior.

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