

Nutrition Fact Panel Use and its Association to Diet Quality among University Students in Universitas Indonesia

Sarah Christy¹, Helda Khusun^{2*}, Dian Novita Chandra¹, Diana Sunardi¹

¹Department of Nutrition, Faculty of Medicine, Universitas Indonesia–Dr. Cipto Mangunkusumo Hospital, Jakarta 10430, Indonesia

²Southeast Asian Ministers of Education Organization Regional Centre for Food and Nutrition (SEAMEO RECFON)–Pusat Kajian Gizi Regional Universitas Indonesia (PKGR UI), Jakarta 13120, Indonesia

ABSTRACT

The aim of this study was to assess the association between Nutrition Fact Panel (NFP) use and diet quality among university students. A comparative cross sectional study was conducted in 2019 among 172 college students living in dormitory of Universitas Indonesia, Depok, Indonesia. Data about socio-economic and demographic characteristics, food preparation, NFP use and nutritional knowledge were collected through interview using structured questionnaire. Nutritional status was obtained by direct height and weight measurement. Diet quality was measured using Diet Quality Index-International (DQI-I) score, derived from 3x24 hours recall. Finding of this study showed that the characteristics of NFP users and non-users were not differed significantly except for nutritional knowledge in which NFP users were 1.852 times more likely to have good knowledge than NFP non-users ($p < 0.05$; 95% CI: 1.009–3.396). The median total diet quality score was categorized as low (44 out of 100). There was no association between NFP use and total diet quality score even after controlling for possible confounder. However, the exploration in each component of diet quality measurement showed adequacy score of calcium was significantly higher in NFP users than non-users ($p < 0.05$). NFP use also positively associated to total variety score ($\beta = 0.985$; $p < 0.05$). Future nutrition interventions could focus on enhancing the use and understanding of NFP among university students.

Keywords: diet quality index-international, nutrition fact panel, nutritional knowledge

INTRODUCTION

University students have been reported to have poor diet quality across countries. A systematic review of 37 studies conducted in Europe, North America, Middle East, South America and Africa found that most university students were likely to consume more fast food, sugar sweetened beverages, sweet and salty packaged snack but less vegetable and fruit (Bernardo *et al.* 2017). Similar situation was also found among university students in Indonesia. A study in Jakarta found that 75% of university students consumed instant food, most of which were instant noodle (Surjadi 2013).

Poor diet quality potentially lead to nutrition related health problem such as obesity, coronary heart disease, and type 2 diabetes mellitus (World Health Organization (WHO) 2018). Therefore, a

preventable action need to be taken to improve dietary habit among university students whom are the potential group to adopt healthier dietary habits which might have a lasting impact in later life (Cooke & Papadaki 2014).

Considering the high exposure of university students toward packaged food, Nutrition Fact Panel (NFP) use could be considered as a simple yet rational preventive effort for improving dietary habit since it is available on most packaged food. NFP, which provide information needed by consumer for identifying healthier food option through the comparison of the food's nutrient content, might become an assisting tool at the time of purchasing (Viola *et al.* 2016). In Indonesia, the importance to read NFP was one out of ten messages in Indonesian balance nutrition guideline (Ministry of Health Republic of Indonesia (MoH RI) 2014).

*Corresponding Author: tel: +628128586856, email: hkhusun@gmail.com

(Received 16-07-2021; Accepted 24-09-2021; Published 29-11-2021)

Finding from a cross sectional study among university students in Turkey showed that NFP users had higher dietary quality score compared to non-users (Buyuktuncer *et al.* 2018). Consistently, another study of college students in Minnesota, United States, had found NFP users associated significantly to healthier dietary practices such as higher consumption of fruit, vegetable and fiber but lower intake of fat and added sugar (Graham & Laska 2012).

However, studies about NFP use and its association to diet quality are largely conducted in developed countries where consumption of packaged foods were relatively high (Buyuktuncer *et al.* 2018; Graham & Laska 2012). To authors' knowledge there is currently limited empirical evidence related to this topic in low and middle income countries with different level of exposure to packaged food and different food habits. This study will use the context of Indonesia, a country categorized as low-middle income (World Bank 2021). Moreover, previous studies in Indonesia about food or nutrition label were mainly discussing the characteristics of label users (Mauludyani *et al.* 2021; Huda & Andreas 2016). Therefore, this present study aimed to investigate the association between NFP use and diet quality among university students in Universitas Indonesia.

METHODS

Design, location, and time

The current study was designed as comparative cross-sectional study in dormitory of Universitas Indonesia, Depok, West Java, Indonesia. It was part of a more comprehensive study which was aimed to assess the association between dietary intake and hydration status among students in Universitas Indonesia. Data collection was conducted from February 2019 to June 2019. Prior to the data collection, approval from the Ethical committee of faculty of Medicine Universitas Indonesia was obtained (no. 1318/UN2.F1/ETIK/2018).

Sampling

Respondents included in the study met several criteria which were Indonesian citizen, undertaking bachelor degree regular education program, having active student status, and willing to participate in this study. Those, who had

serious co-morbidities that could alter the usual dietary intake (e.g. chronic infectious disease, chronic diarrhea, and undergoing any medication or diet therapies) and disability, were excluded from the study. Furthermore, respondents were classified into two groups which are NFP users and non-users group according to their frequency of reading NFP. Those who 'always or most of the times or sometimes' read NFP categorized as NFP users, while those who 'never or rarely' read NFP categorized as NFP non-users.

Sample size needed was calculated using formula for hypothesis test for two population means (two sided test) with 95% confidence level and 80% of power, based on mean difference of diet quality score between NFP users (67.1 ± 12.23) and non-users (60.7 ± 10.11) among university students from previous study (Buyuktuncer *et al.* 2018). After taking into consideration design effect of 1.5 and non-response rate 15%, minimum sample size required were 85 respondents per group or 170 respondents in total for two groups. The respondents were recruited based on non-probability quota sampling. Students who attended the dormitory's canteen, met the criteria of the study, and signed the informed consent were invited directly on voluntary bases until each quota of NFP users and non-users group were filled.

Data collection

An interview using structured questionnaire was conducted to collect data about socioeconomic and demographic characteristics, NFP use, dietary intake, food preparation status and nutritional knowledge. The questionnaire had been pretested previously among 30 subjects who had similar characteristics to the study population. Specifically, nutrition knowledge questionnaire had been tested for its reliability resulted in Cronbach alpha of 0.859. Nutrition knowledge in the current studies encompassed four topics which were dietary recommendation (four questions), source of nutrients (five questions), diet disease relationship (four questions) and understanding of NFP (ten questions). Final score of nutrition knowledge was categorized into two groups either as lower or higher knowledge with cut off of 70 (Iswarawanti 2012).

Food preparation status was defined as any practice of purchasing or cooking food daily by respondents themselves in the past 30 days. Those who had ever done grocery shopping or cooked

food in the past 30 days would be categorized as “yes” while others were “no”.

Weight and height measurement was conducted by trained enumerators using standardized protocol (Fahmida & Dillon 2007). Weight was measured using SECA weighing scale 876 to the nearest 0.1 kg, while height was measured using height measuring board wooden (shorr-board) to the nearest 0.1 cm. Weight and height was converted into Body Mass Index (BMI) and classified based on WHO BMI cut offs for Asian population to define the nutritional status of respondents. The categorization was overweight, normal, and underweight for those with BMI ≥ 23 kg/m², 18.5–22.9 kg/m² and < 18.5 kg/m² respectively (WHO 2004).

Dietary quality was measured using a dietary metric, particularly the Diet Quality Index-International (DQI-I) derived from 3x24 hours non-consecutive food recall. Habitual diet of each respondent was calculated using a complex, component specific, and unequal weighted scoring (Miller *et al.* 2020). Briefly, DQI-I scoring system was assigned on four major aspects which were variety (overall food group variety and within group variety for protein), adequacy (vegetable group, grain group, fiber, protein, iron, calcium and vitamin C), moderation (total fat, saturated fat, cholesterol, sodium, and empty calorie foods) and overall balance (macronutrient and fatty acid ratio). Score range of variety, adequacy, moderation and overall balance was respectively 0–20, 0–40, 0–30, 0–10 resulting in maximum score of 100. Higher score indicated higher diet quality and adherence to dietary recommendation (Kim *et al.* 2003).

Prior to data analysis, food database had been developed. Value of energy, carbohydrate, protein, fat, sodium, iron, vitamin C, fiber and calcium were obtained from Food Composition Table (FCT) of Indonesia. If several cooked food, nutrients (e.g. PUFA, MUFA, SFA and cholesterol) and complex dishes were not available in Indonesian FCT, this study applied borrowing technique from other countries' FCTs that provide those information. The similar characteristic to Indonesian circumstances and data completeness became consideration for using other FCTs (MoH RI 2017). In addition, for packaged food and drinks that have NFP attached on it, the nutrients from manufacture's labels were also used.

Data analysis

All analysis were performed using SPSS for Windows version 20.0. Level of significance was set at $p < 0.05$. Normality was examined using kolmogorov-smirnov test ($p < 0.05$). Since all continuous variables including age and diet quality score had a non-normal distribution, data were presented as median (minimum–maximum value). Meanwhile, categorical data were presented in frequencies and percentage.

A chi square analyses applied to examine the differences of characteristics (gender, education major, mother's education, pocket money, nutritional status, food preparation activity and nutrition knowledge) between NFP users and non-users. The non-parametric mann-whitney test were performed to assess the difference of diet quality score between these two groups as well as age. Furthermore, all variables that had $p < 0.25$ in bivariate analysis, were used for multiple linear regressions test to examine the association between NFP use to total diet quality, variety, adequacy, moderation and overall balance score by adjusting the possible confounders particularly for socioeconomic demographic characteristics.

RESULTS AND DISCUSSION

Socioeconomic demographic characteristics

There were 172 respondents participated in the study, consisted of 85 NFP non-users and 87 NFP users. Table 1 presented the general characteristics of respondents by NFP use. Age of respondents ranged from 18–21 years old with a median age of 19 years. The majority of respondents were female (59%), had normal nutritional status (53%), taking non-health major program (67%), having mother with more than nine years of education (72.7%), having allocation for food more than median (IDR 900,000 or US\$ 62.90) in a month (54.7%), engaged in food preparation activities including cooking and grocery shopping in past 30 days (63.4%) and categorized in lower nutritional knowledge (86%). Almost all characteristics were comparable between NFP users and non-users groups except for the nutrition knowledge, whereas the NFP users were 1.852 times more likely to have higher knowledge than the non-users ($p < 0.05$; 95% CI: 1.009–3.396).

Table 1. Socioeconomic demographic characteristics of respondents by NFP use

Characteristics	All respondents (n=172)	NFP non users (n=85)	NFP users (n=87)	p
	n (%) or median (min-max)	n (%) or median (min-max)	n (%) or median (min-max)	
Age (years) ^a	19 (18–21)	19 (18–21)	19 (18–21)	0.238 ¹
Gender				
Male	70 (41)	36 (42)	34 (39)	0.662 ²
Female	102 (59)	49 (58)	53 (61)	
Education major				
Non-health program	116 (67)	60 (71)	56 (64)	0.384 ²
Health program	56 (33)	25 (29)	31 (36)	
Mother's education				
≤9 schooling years	47 (27.3)	61 (72)	62 (71)	0.942 ²
>9 schooling years	125 (72.7)	24 (28)	25 (29)	
Monthly pocket money for food				
≤IDR 900,000	78 (45.3)	37 (44)	41 (47)	0.636 ²
>IDR 900,000	94 (54.7)	48 (56)	46 (53)	
Nutritional status				
Normal	92 (53)	49 (58)	43 (50)	0.506 ²
Underweight	29 (17)	14 (16)	15 (17)	
Overweight	51 (30)	22 (26)	29 (33)	
Food preparation status				
No	63 (36.6)	30 (35)	33 (38)	0.720 ²
Yes	109 (63.4)	55 (65)	54 (62)	
Nutrition knowledge				
Lower knowledge	148 (86)	80 (94)	68 (78)	0.003 ^{2,*}
Higher knowledge	24 (14)	5 (6)	19 (22)	

NFP: Nutrition Fact Panel use was assessed using a question asking for frequency of reading panel

Response range from 0 to 4; where 0:never and 4:always; Those responding “always”; “most of the time”; and “sometimes” were categorized as users and others as non-users

^aMedian (min-max); ¹Mann-whitney u test analysis; ²Chisquare test analysis; *Significance level at p<0.05

IDR: Indonesian Rupiah

Diet quality of respondents

Total diet quality score and its subcomponents were described in Table 2. No significant different was found in total DQI-I score between the NFP users and non-users. In the two groups, the median score of total diet

quality was 44 out of 100. It was categorized low based on the original version of DQI-I which used score ≥ 60 as the cut off to define good diet quality (Kim *et al.* 2003).

The majority of DQI-I subcategories score had equal median value both in NFP users and

Association of diet quality and NFP use

Table 2. Total and component DQI-I scores by NFP use of respondents

Component score of DQI-I	Nutrition fact panel		p ¹
	Non users (n=85) ^a	Users (n=87) ^a	
Variety	9 (3–18)	10 (3–18)	0.061
Overall food group variety	6 (3–15)	9 (3–15)	0.063
Within group variety for protein sources	1 (0–5)	3 (0–5)	0.302
Adequacy	19 (12–30)	19 (12–28)	0.490
Vegetable group	1 (0–1)	1 (0–1)	0.548
Fruit group	1 (0–3)	1 (0–3)	0.609
Grain group	3 (1–5)	3 (1–5)	0.729
Fiber	1 (1–3)	1 (1–3)	0.548
Protein	5 (3–5)	5 (3–5)	0.193
Iron	3 (1–5)	3 (1–5)	0.819
Calcium	3 (1–5)	3 (1–5)	0.003*
Vitamin C	3 (1–5)	1 (1–5)	0.666
Moderation	15 (3–30)	15 (0–24)	0.164
Total fat	3 (0–6)	0 (0–6)	0.517
Saturated fat	0 (0–6)	0 (0–6)	0.570
Cholesterol	6 (0–6)	6 (0–6)	0.468
Sodium	6 (0–6)	6 (0–6)	0.451
Empty calorie foods	3 (0–6)	0 (0–6)	0.052
Overall balance	0 (0–6)	0 (0–6)	0.607
Macronutrient ratio	0 (0–6)	0 (0–6)	0.607
Fatty acid ratio	0 (0–0)	0 (0–0)	1.00
Total DQI-I score	44 (33–63)	44 (29–63)	0.984

DQI-I: Diet Quality Index International

¹Mann-whitney u analysis test; *Significance level at p<0.05; ^aMedian (min–max)

non-users group. The median score of DQI-I major subcategories including adequacy, moderation and overbalance respectively were 19, 15 and 0. Unlike the other main subcategories, total variety score in NFP users had slightly higher value than non-users (10 vs. 9). All these scores only achieved ≤50% of perfect score which indicated

that the characteristics of diet among university students responding to this study were lack of variety, deficient in favorable nutrients, excessive in unfavorable nutrients and imbalance in proportionality. This typical diet were also found in other studies among Indonesian urban adult population. Those studies consistently revealed

that the median score of total DQI-I, adequacy, moderation and overall balance only fulfill less than half of maximum score (Sartika 2018; Birahmatika 2020).

Association between NFP use and diet quality

The main objective in this study was to assess the association between NFP use and diet quality among university students in Universitas Indonesia. Table 2 showed that there was no statistical difference in total DQI-I score and its subcomponents between NFP users and non-users except for the adequacy score of calcium ($p < 0.05$). NFP users compared to non-users had overall higher score. Exploration in the frequency distribution of calcium adequacy score showed that the proportion of NFP non-users got score of 1, 3 and 5 were 15.3%, 76.5% and 8.2% respectively, while NFP users were 4.6%, 75.9% and 19.5% respectively. Study of Graham and Laska (2012) found similar finding. There was slightly (although not significantly) higher intake of calcium and dairy in frequent label readers compared to non-readers.

After controlling for possible confounders including gender and food preparation status, the result revealed that NFP use had no significant contribution to predict total diet quality score (Table 3). It was in contrast to the study conducted by Christoph and An (2018) which found significant association between NFP use and various intake of food groups and nutrients.

NFP use had no association to total adequacy, moderation, and overall balance score as well (Table 4). Nonetheless, it was positively associated to total variety score ($\beta = 0.985$; $p < 0.05$). It is in line with previous studies among university students that showed NFP users had significant higher consumption of fruit and

vegetable compared to non-user (Buyuktuncer *et al.* 2018; Graham & Laska 2012).

Other factors including doing food preparation ($\beta = -1.995$; $p < 0.05$) and being a female ($\beta = -1.389$; $p < 0.05$) were negatively associated to total variety score (Table 4). Being a female were also contributed to lower total adequacy score ($\beta = -1.513$; $p < 0.05$). Those findings were in line with the result from a cross sectional study among university students in Germany. The previous study reported that female students compared to male had significantly lower food group consumption of protein (e.g. poultry, sausages, fish, and cheese) and grain (e.g. pasta and rice). Gradually it might lead to poorer variety and adequacy aspects of diet quality (Hilger *et al.* 2017). Another study discussing dietary intake of Malaysian university students informed that most students (85%) would sometimes prepare their food, yet instant noodles were the most frequent type of food they cooked. Surjadi (2013) through deep interview of several university students in Jakarta also reported that students preferred to cook instant noodle while studying at night since it was more practical and cheaper. Therefore, preparing food activity among university students might contribute to lower variety of food consumed.

The non-significant association between NFP use and diet quality might be explained by some possible rationales. Firstly, NFP users surveyed in this study likely had inadequate understanding to interpret information given on the panel. Consequently, food contained more unfavorable nutrients was selected and gradually affected diet quality. Supporting results on nutrition knowledge questionnaire in this study particularly in the section of understanding NFP showed that less than 25% NFP users could

Table 3. Multiple regression analysis for factors associated to total diet quality score

Independent variables	B	SE(B)	p
Intercept	48.226	1.951	
Food preparation status	-1.839	1.089	0.093
Gender (being a female)	-1.280	1.068	0.233
NFP use	0.118	1.049	0.910

B: Regression coefficient; SE(B): SE of the regression coefficient

R square: 0.026 analyzed with multiple linear regression using enter method; NFP: Nutrition Fact Panel

Association of diet quality and NFP use

Table 4. Multiple regression analysis for factors associated to total variety, adequacy, moderation, and overall balance score

Dependent variables	Independent variables	B	SE (B)	p	R square ¹
Total variety score	Food preparation status	-1.995	0.485	0.000*	0.169
	Gender (being a female)	-1.389	0.476	0.004*	
	Age (years)	0.344	0.267	0.2	
	NFP use	0.985	0.469	0.037*	
Total adequacy score	Age (years)	0.393	0.295	0.184	0.095
	Gender (being a female)	-1.513	0.536	0.005*	
	Mother's education	0.371	0.595	0.534	
	Food preparation status	-1.032	0.535	0.055	
	NFP use	0.492	0.519	0.345	
Total moderation score	Age (years)	-0.456	0.419	0.278	0.082
	Gender (being a female)	1.445	0.753	0.057	
	Monthly pocket money for food	-1.471	0.743	0.05	
	Food preparation status	1.028	0.762	0.179	
	NFP use	-1.241	0.735	0.093	
Total overall balance score	Age (years)	-0.218	0.171	0.204	0.019
	Nutritional status	-0.086	0.171	0.616	
	Food preparation status	0.288	0.311	0.356	
	NFP use	-0.122	0.301	0.687	

B: Regression coefficient; SE(B): SE of the regression coefficient; NFP: Nutrition Fact Panel

*Significance level at p<0.05; ¹Multiple linear regression analysis using enter method

correctly answered questions asking for a food contained the least calories, least sugar and most sodium from three panels given.

Research suggest that proper understanding and frequent use of nutrition label could assist people to select healthier food and beverage products. Hence, it may improve dietary intake (Lim *et al.* 2015; Liu *et al.* 2015). However, technical and numerical information on nutrition label (e.g. serving size, serving per container and

% Recommended Dietary Allowance) were hard to understand by general population (Cowburn & Stockley 2005). In consequence, it might disrupt people to choose healthier food option.

Secondly, respondents participated in current study might had negligence of NFP's information. It was supported by another finding on this study which showed that among students with good understanding, there were possibility to not always use NFP because of time barrier,

price and flavor of food. Consistently, previous studies also implied that nutritional knowledge alone might be not a sufficient reason for label use. Other factors such as foods' price and taste (Mauludyani *et al.* 2021; Talagala & Arambepola 2016), positive attitude to diet (Cowburn & Stockley 2005) and time constraint (Rasberry *et al.* 2007) could influence nutrition label use among adolescent and adult. Finally, another possible consideration to explain the lack of association between NFP use and diet quality may be linked to the overall low diet quality score in total and its components among respondents.

The present study used measures of diet quality which covered various aspects of diet including variety, adequacy, moderation and overall balance to portray the complexity of diet, rather than simply nutrient intake. These measures were developed using non-consecutive 3x24-h recall which increases the validity and reliability of the assessment to represent the habitual diet of the respondents. Nonetheless, the limited FCT available for Indonesia may introduce error in the determination of nutrient content that may lead to misclassification. However, these errors was believed to be at random and did not introduce bias toward the result of the study. Moreover, several effort has been done to minimize the error by using standardized borrowing method considering retention and yield factor (MoH RI 2017).

The study used quota sampling on voluntary bases, and thus may lead to selection bias, where respondents who were keener to their health participated in the study; but the tendency is similar for both groups. The study could only be generalized to university students with similar characteristics to the study subjects. Another limitation include the basis to classify NFP users and non-users which was only from a question asking for frequency reading panel. Future study could add other aspects such as understanding of NFP and attention to specific content reading on panel.

CONCLUSION

This study found that the dietary quality among university students participated in the current study was poor. Although NFP use and total diet quality score had no association, the exploration in each component of diet quality

score showed calcium adequacy score was statistically different between NFP users and non-users in which NFP users compared to non-users had overall higher score. In addition, NFP use was also positively associated to total variety score. NFP use may have a role for improving diet quality. Future nutrition intervention could focus to enhance the understanding of technical and numerical information attached on NFP among university students in order to maximize the usage of NFP for selecting healthier food option. Moreover, simplifying NFP's information could also become another strategy to increase the understanding of NFP by general population.

ACKNOWLEDGEMENT

The authors would like to thank Anggun Nurvika Putri and Sifa Aulia Wicakari as the research teams. We would like to thank Indonesian Hydration Working Group (IHWG) to give partial support for subject inducement and food photograph books. Appreciation is also given to SEAMEO RECFON for supporting research instruments.

DECLARATION OF INTERESTS

The authors declare that no conflict of interest with other person or institution.

REFERENCES

- Bernardo GL, Jomori MM, Fernandes AC, Proença RPC. 2017. Food intake of university students. *Rev Nutri Campinas* 30(6):847–865. <https://doi.org/10.1590/1678-98652017000600016>
- Birahmatika FS. 2020. Home food environment as mediator between health concern and diet quality among mothers of young children in urban slum in North Jakarta [Thesis]. Jakarta: Universitas Indonesia.
- Buyuktuncer Z, Ayaz A, Dedebyraktar D, Inan-Eroglu E, Ellahi B, Besler HT. 2018. Promoting a healthy diet in young adults: The role of nutrition labelling. *Nutrients* 10(10):1335. <https://doi.org/10.3390/nu10101335>
- Christoph MJ, An R. 2018. Effect of nutrition labels on dietary quality among college students: A systematic review and meta-

- analysis. *Nutr Rev* 76(3):187–203. <https://doi.org/10.1093/nutrit/nux069>
- Cooke R, Papadaki A. 2014. Nutrition label use mediates the positive relationship between nutrition knowledge and attitudes towards healthy eating with dietary quality among university students in the UK. *Appetite* 83:297–303. <https://doi.org/10.1016/j.appet.2014.08.039>
- Cowburn G, Stockley L. 2005. Consumer understanding and use of nutrition labelling: A systematic review. *Public Health Nutr* 8(1):21–28. <https://doi.org/10.1079/PHN2004666>
- Fahmida U, Dillon DHS. 2007. *Handbook of Nutritional Assessment*. Jakarta (ID): SEAMEO-TROPMED RCCN University of Indonesia.
- Graham DJ, Laska MN. 2012. Nutrition label use partially mediates the relationship between attitude toward healthy eating and overall dietary quality among college students. *J Acad Nutr Diet* 112(3):414–418. <https://doi.org/10.1016/j.jada.2011.08.047>
- Hilger J, Loerbroks A, Diehl K. 2017. Eating behaviour of university students in Germany: Dietary intake, barriers to healthy eating and changes in eating behaviour since the time of matriculation. *Appetite* 109:100–107. <https://doi.org/10.1016/j.appet.2016.11.016>
- Huda QAY, Andrias DR. 2016. Sikap dan perilaku membaca informasi gizi pada label pangan serta pemilihan pangan kemasan. *Media Gizi Indonesia* 11(2):175–181. <https://doi.org/10.20473/mgi.v11i2.175-181>
- Iswarawanti DN. 2012. The effectiveness of training on cadres' competencies in communicating safe complementary feeding to caregivers [Dissertation]. Jakarta: Universitas Indonesia.
- Kim S, Haines PS, Siega-Riz AM, Popkin BM. 2003. The diet quality index-international (DQI-I) provides an effective tool for cross-national comparison of diet quality as illustrated by China and the United States. *J Nutr* 133(11):3476–3484. <https://doi.org/10.1093/jn/133.11.3476>
- Lim HJ, Kim MJ, Kim KW. 2015. Factors associated with nutrition label use among female college students applying the theory of planned behavior. *Nutr Res Pract* 9(1):63–70. <https://doi.org/10.4162/nrp.2015.9.1.63>
- Liu R, Hoefkens C, Verbeke W. 2015. Chinese consumers' understanding and use of a food nutrition label and their determinants. *Food Qual Prefer* 41:103–111. <https://doi.org/10.1016/j.foodqual.2014.11.007>
- [MoH RI] Ministry of Health Republic of Indonesia. 2014. Peraturan menteri kesehatan nomor 41 tahun 2014 tentang pedoman gizi seimbang. <http://gizi.depkes.go.id/download/Pedoman%20Gizi/PGS%20Ok.pdf> [Accessed on 8th January 2019].
- [MoH RI] Ministry of Health Republic of Indonesia. 2017. *Pedoman Metode Melengkapi Nilai Gizi Bahan Makanan pada Tabel Komposisi Pangan Indonesia (Imputed and Borrowed Values)*. Bogor (ID): MoH RI.
- Mauludyani AVR, Nasution Z, Aries M, Rimbawan R, Egayanti Y. 2021. Knowledge on nutrition labels for processed food: Effect on purchase decision among Indonesian consumers. *J Gizi Pangan* 16(1):47–56. <https://doi.org/10.25182/jgp.2021.16.1.47-56>
- Miller V, Webb P, Micha R, Mozaffarian D, Database GD. 2020. Defining diet quality: A synthesis of dietary quality metrics and their validity for the double burden of malnutrition. *Lancet Planet Health* 4(8):e352–e370. <https://doi.org/10.1093/cdn/nzz039>.OR17-01-19
- Raspberry CN, Chaney BH, Housman JM, Misra R, Miller PJ. 2007. Determinants of nutrition label use among college students. *Am J Health Educ* 38(2):76–82. <https://doi.org/10.1080/19325037.2007.10598947>
- Sartika AN. 2018. Association of eating behavior and diet quality among adults living in urban and rural area of east java [Thesis]. Jakarta: Universitas Indonesia.
- Surjadi C. 2013. Globalisasi dan pola makan mahasiswa: Studi kasus di Jakarta. *Cermin Dunia Kedokteran* 40(6):416–421.
- Talagala IA, Arambepola C. 2016. Use of food labels by adolescents to make healthier choices on snacks: A cross-sectional study from Sri Lanka. *BMC Public Health* 16(1):1–11. <https://doi.org/10.1186/s12889-016-3422-1>

- Viola GCV, Bianchi F, Croce E, Ceretti E. 2016. Are food labels effective as a means of health prevention?. *J Public Health Res* 5(3):768. <https://doi.org/10.4081/jphr.2016.768>
- World Bank. 2021. The World Bank in Indonesia: Overview. <https://www.worldbank.org/en/country/indonesia/overview> [Accessed on 12th August 2021].
- [WHO] World Health Organization. 2018. World health statistics 2018: Monitoring health for the SDGs sustainable development goals. World Health Organization. https://www.who.int/gho/publications/world_health_statistics/2018/EN_WHS2018_TOC.pdf?ua=1 [Accessed on 8th November 2018].
- WHO Expert Consultation. 2004. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. *The Lancet* 363(9403):157–163. [https://doi.org/10.1016/S0140-6736\(03\)15268-3](https://doi.org/10.1016/S0140-6736(03)15268-3)