ORIGINAL ARTICLE

THE HEALTH BELIEF MODEL COMBINED WITH EDUCATION ON HEALTHY FOOD PREPARATION TO IMPROVE DIETARY IRON INTAKE AMONG ADOLESCENT GIRLS

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ABSTRACT

Anemia is still a public health problem among adolescent girls in low and middle-income countries (LMICs), and nutrition education is needed to improve their iron intake. Therefore, this study aims to measure the effects of nutrition education based on HBM combined with training about healthy food preparation to improve dietary iron intake among adolescent girls in boarding schools. This research was a pre test post test control group design. The intervention group (IG) consists of two boarding schools, forty adolescent girls, and six cooks, while the control group (CG) contains four boarding schools, forty adolescent girls, and ten cooks. Nutrition education based on HBM combined with training about healthy food preparation was held for the IG with follows-ups 4 and 12 weeks after the intervention. After the process, data were collected from both groups and analyzed using an independent t-test and Mann Whitney. The dietary intake of energy, protein, and iron, namely 1421.1 kcal ±363.7-1543.4 kcal ±28.5, 32.3 g ±8.6-49.7 g ±6.7, and 7.8 mg-12.1 mg±2.0, respectively, increased at follow-up 1 in the IG. The results showed that there were differences in the dietary energy, protein, and iron intake both groups at follow-ups 1 and 2 ($p<0.05$). These findings indicate that HBM strategies combined with education about healthy food preparation can improve dietary iron intake among adolescent girls in boarding schools. Therefore, the authority can consider using this pattern to design and perform educational interventions to increase iron consumption.

***Keywords**: adolescent girls, iron intake, nutrition education, HBM, healthy food preparation*

INTRODUCTION

One-sixth of the world's population are adolescents aged 10-19 years with a total of 1.2 billion people, of which 90% live in low- and middle-income countries (LMICs)[1]. Adolescent girls often face various nutritional problems, such as anemia[2], which continues until pregnancy. Furthermore, the condition increases the risk of morbidity and mortality for both mother and child[3]. Anemia in pregnancy can also cause preterm delivery and low birth weight (LBW)[4].

Its occurrence in adolescent girls is caused by rapid growth and inadequate iron intake[5]. Food preparation-skill play a very vital role in achieving the necessary dietary intake[6]. A recent review revealed that lack of preparation knowledge is a barrier to the cooking of healthy meals, such as iron-rich foods[7]. The cook's confidence in the ability to prepare healthy meals is also significantly related to the healthfulness of the food[8].

Childhood and adolescence are essential stages in the formation of good eating behaviour[9]. Poor habits in adolescents can be improved by increasing nutritional knowledge through education[10]. Educational strategies play a decisive role in determining the success of interventions[11]. The HBM (Health Belief Model) strategy has been proven as an essential instrument for assessing health behaviors[12]. The HBM concept comprises of perceived susceptibility, severity, benefits, barriers, and self-efficacy to perform the behavior. The focus of this model is that changes in beliefs can lead to behavioral changes[13]. The application of HBM can be used as a framework for nutrition education interventions to improve eating habits in adolescents[14].

Adolescents' diet in boarding schools is monotonous, dominated by plant-based meals, and inadequate in iron[15]. There are several Islamic schools in Indonesia because the majority of people in the country are Muslims[16], and West Java is the most populated province with the highest number of boarding facilities[17]. Previous reports revealed that students are facing a severe public health problem, which is related to the prevalence of anemia among adolescent girls[18]. Therefore, this study aims to determine the effect of nutrition education based on the Health Belief Model combined with training about healthy food preparation on calories, protein, and iron intake among adolescent girls in boarding schools

METHODS

Study Design and Participants

This was a pre-test post-test control group design study, which was carried out for four months in boarding schools in Tasikmalaya, West Java Province, Indonesia, and the sample population consists of adolescent female students. The schools used were selected based on several inclusion criteria, namely providing a place to live in, still active, providing meals, and willingness to participate, which was proven by the principal signing the informed consent. A total of six met the criteria, and they were randomly divided into the intervention group (IG) and the control group (CG). Participants in the IG were in different schools from CG, and the CG was not aware of the intervention given to IG.

Furthermore, the participants were adolescent girls aged 12-18 years living in a boarding school and willing to participate signing an informed consent, which was also signed by their parents. This study also involved the cooks in the facilities, and they signed informed consent before the study was carried out.

Based on the standard deviation from Keshani P, et al[19], the calculation of the minimum sample size with a power of 90% gave a total of 32 participants. Subsequently, 8 students (25%) were added to each group in anticipation of drop-out. The total sample size was 80 participants, which were divided equally between the IG and CG. A flowchart of the selection procedure is presented in Figure 1.

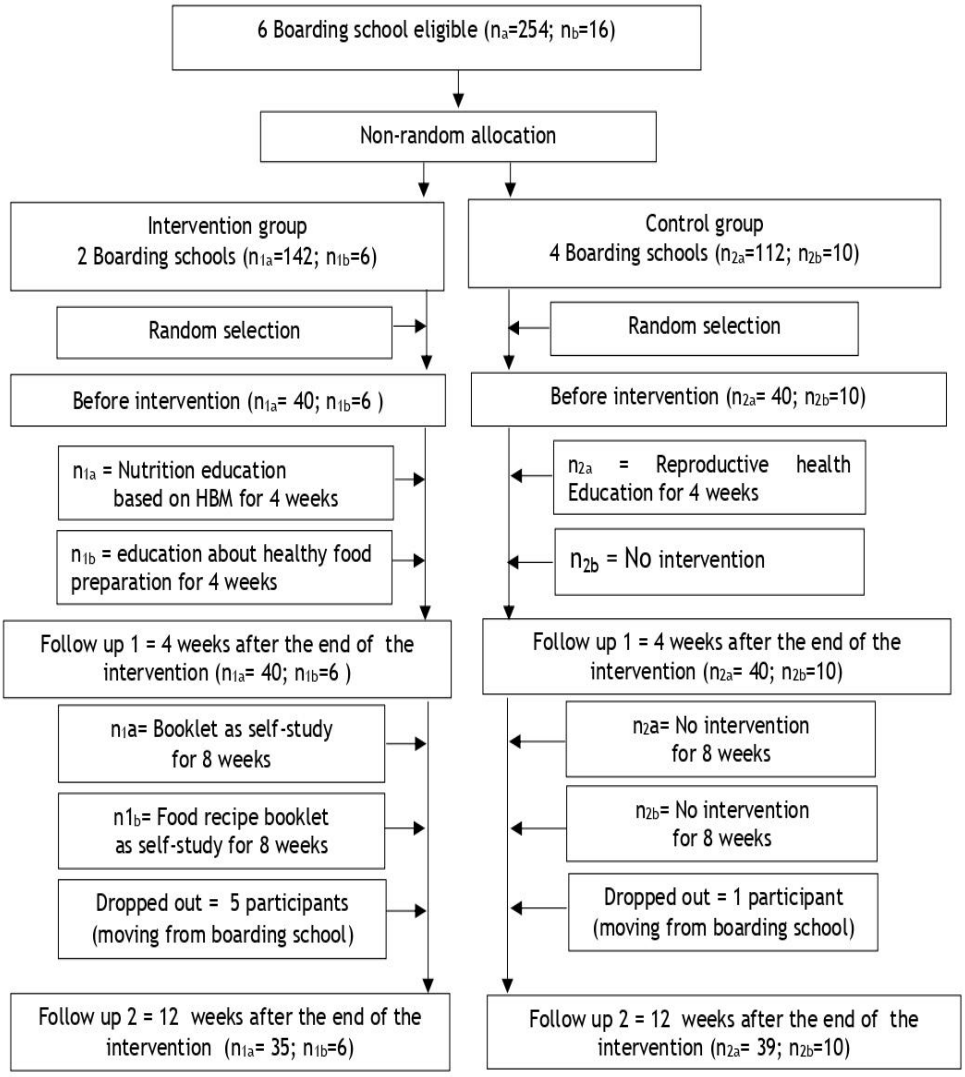

Figure 1: Study flow diagram

Description of Intervention

In the intervention group (IG), participants received nutrition education based on the HBM, and their cooks received training about healthy food preparation. Meanwhile, the control group (CG) received reproductive health education.

Students in IG were given the intervention for 60-90 minutes once a week for a total of four weeks using the lecture and discussion methods. Each of the participants was also given a booklet for self-study. The contents of nutrition education were:

1. The first meeting explained anemia in adolescent girls, namely its definition, causes, signs, and symptoms. The participants were also educated about their susceptibility to the disease, which can be found in chapters 1 and 2 of the booklet.
2. The second meeting explained the severe impact of anemia on adolescent girls, which can be found in chapter 3 of the booklet.
3. The third meeting showed the benefits of preventing anemia among adolescent girls by eating healthy foods, which can be found in chapter 4 of the booklet.
4. The fourth meeting revealed the barriers affecting anaemia prevention and the efficacy of implementing the intake of healthy foods, which can be found in chapter 4 of the booklet.

The boarding school cooks were also trained on healthy food preparation every week for four consecutive weeks, and the session lasted for 60-90 min. Furthermore, each of them was given a food recipe booklet for self-study. The attendance of the students and cooks was recorded to determine their level of compliance. The training session in the IG was carried out by the same trainer to ensure that the intervention was balanced between both schools.

In CG, reproductive health education was given once a week for a total of four weeks. The material includes introducing female reproductive organs, puberty in adolescent girls, reproductive health problems in women, and menstrual problems.

Data Collection

The demographics data of the students were measured once at baseline, including age (years), age at menarche (years), length of menstruation (days), pocket money (IDR/day), father's employment status (formal and informal sector), and mother's employment status (work and not work). Meanwhile, the demographic data of boarding school cooks include age (years) and gender (female and male).

Nutritional knowledge, Health Belief Model constructs, and dietary intake were measured three times, namely before the intervention, four weeks after education (follow-up 1), and 12 weeks after the education (follow-up 2). Data on nutritional knowledge and the construct of HBM were collected using a structured questionnaire, which was previously tested for Cronbach's alpha value to determine its reliability. It was tested on 40 adolescent girls with similar characteristics to the participants, but are living in boarding schools in other cities.

The details of the questionnaire were as follows:

1. The nutritional knowledge questionnaire consisted of 19 items, a correct answer was given 1 point, while an incorrect was given 0 point. The total scores were 0 to 19, and higher scores indicated better nutritional knowledge. The value of Cronbach's alpha was 0.886.
2. Perceived susceptibility was measured with 10 items, which were scored using a 3-point Likert scale, namely 0= 'disagree', 1 = 'neutral', and 2 = 'agree'. The total scores were 0 to 20, and higher scores indicated better-perceived susceptibility. The value of Cronbach's alpha was 0.890.
3. Perceived severity was measured with 10 items, which were scored using a 3-point Likert scale, namely 0= 'disagree', 1 = 'neutral', and 2 = 'agree'. The total scores were 0 to 20, and higher scores indicated better-perceived severity. The value of Cronbach's alpha was 0.870.
4. The perceived benefit was measured with 11 items, which were scored using a 3-point Likert scale, namely 0= 'disagree', 1 = 'neutral', and 2 = 'agree'. The total scores were 0 to 22, and higher scores indicated a better-perceived benefit. The value of Cronbach's alpha was 0.795.
5. Perceived barriers were measured with nine items, which were scored using a 3-point Likert scale, namely 0= 'disagree', 1 = 'neutral', and 2 = 'agree'. The total scores were 0 to 18, and a lower score indicated better-perceived barriers. The value of Cronbach's alpha was 0.793.
6. Self-efficacy of healthy eating was measured with 11 items, which were scored using a 3-point Likert scale, namely 0= 'not confident', 1 = 'neutral', and 2 = 'confident'. The total scores were 0 to 22, and a higher score indicated better self-efficacy. The value of Cronbach's alpha was 0.872.

Dietary intake calories (kcal), protein (g), and iron (mg) were measured using a 3x24-hour non-consecutive recall method, after which the average consumption was calculated[20]. Food photos were used to improve the accuracy of household size estimates, such as teaspoon, tablespoon, and other tableware. Furthermore, NutriSurvey was used to analyze the dietary intake data, which was measured by four trained students from the nutrition department.

Ethical Approval

This study was approved by the Research Ethics Commission of the Faculty of Public Health,

Universitas Diponegoro, Indonesia, with Protocol Number 39/EA/KEPK-FKM/2020.

Statistical Analysis

Raw data was inputted into excel 2019, and the statistical analyses were performed using the Statistical Package for Social Science (SPSS) version 26.0. Furthermore, categorical and continuous data were presented as frequency distribution tables and mean (SD), respectively. To compare the scores of nutritional knowledge, HBM constructs, and dietary intake between IG and CG, independent samples t-test and Mann Whitney were used for normally distributed and undistributed data, respectively. Shapiro Wilk was used to determine the normality of the distribution. The data were considered statistically significant with a p-value <0.05.

RESULTS

The sample population consisted of 80 adolescent girls at the beginning of the study, but only 74 were included in the final analyses because five participants in IG and 1 participant in CG dropped out in the follow-up 2. The details of the drop-out are described in Figure 1. Furthermore, all the students and cooks complied with the interventions.

The mean age of participants in the IG and CG were 15.1 and 15.7 years, respectively. The mean pocket money at baseline in the IG and CG was IDR 10295.2 and IDR 10811.9, respectively. The two groups were not significantly different in terms of demographic characteristics (*P*>0.05). All boarding school cooks were female, with a mean age of 47 and 37.5 years in the IG and CG, respectively, as shown in Table 1.

Table 1: Demographic characteristics of participants and boarding school cooks

Demographic characteristics	IG	CG	*p*-Value
Participants			
Age (years)*	15.1(1.6)	15.7(1.5)	0.141[a]
Age at menarche (years)*	12.2(0.8)	12.2(0.9)	0.726[a]
Length of Menstrual (days)*	7.4(1.4)	7.6(1.7)	0.840[a]
Pocket money (IDR/days)*	10295.2(3529.3)	10811.9(5392.1)	0.821[a]
Father'employment**			1.00[b]
Formal	1(2.9)	1(2.6)	
Informal	34(97.1)	38(97.4)	
Mother's employment**			0.740[b]
Work	4(11.4)	6(15.4)	
Not work	31(88.6)	33(84.6)	
Boarding school cook			
Age (years)*	47.00(14.7)	37.50(11.1)	0.113[a]
Gender **			-
Female	6(100)	10(100)	
Male	0(0)	0(0)	

**Data have been shown as mean(SD); **Data have been shown as n(%); IG= Intervention Group; CG=Control Group; [a]derived from Mann Whitney; [b]derived from chi-square*

The mean score of nutritional knowledge and all HBM constructs showed no significant difference between the IG and CG at the baseline. At follow-ups 1 and 2, nutritional knowledge and HBM constructs score increased, while the perceived barriers decreased in the IG. However, the nutritional knowledge and HBM constructs scores at follow-up 2 decreased slightly compared to 1, except for the perceived benefit score. At follow-up 2, the perceived barriers slightly increased. The nutritional knowledge and HBM construct score at both follow-ups was significantly different between the IG and CG (*P*<0.05), as shown in Table 2.

Table 2: Comparison between intervention and control groups in nutritional knowledge and Health Belief Model (HBM) scores*

Nutritional Knowledge and HBM Constructs	Before Intervention			Follow up-1			Follow-up 2		
	IG	CG	*p*-Value	IG	CG	*p*-Value	IG	CG	*p*-Value
Knowledge	7.5(3.1)	7.9(2.6)	0.469[a]	13.1(2.9)	8.6(2.3)	0.001[b]†	10.2(2.1)	8.7(2.5)	0.019[a]†
Perceived susceptibility	9.7(3.7)	9.5(2.8)	0.605[b]	12.9(3.2)	10.6(3.4)	0.004[a]†	12.5(2.6)	10.9(2.7)	0.010[a]†
Perceived severity	10.3(3.1)	9.9(2.1)	0.259[b]	11.1(2.6)	9.4(3.8)	0.041[b]†	11.0(2.1)	9.6(2.9)	0.020[a]†
Perceived benefits	7.7(2.4)	8.2(2.7)	0.416[a]	9.8(2.4)	8.2(2.7)	0.009[a]†	10.1(2.5)	8.7(3.1)	0.034[a]†
Perceived barriers	11.7(2.1)	11.9(2.2)	0.756[b]	9.2(2.2)	10.5(1.7)	0.024[b]†	10.2(2.1)	11.1(1.8)	0.039[b]†
self-efficacy	7.9(2.8)	7.5(2.4)	0.459[b]	11.2(2.3)	10.1(2.2)	0.027[a]†	10.9(3.2)	9.2(2.5)	0.011[b]†

**Data have been shown as mean(SD); IG: Intervention Group; CG: Control Group; [a]derived from t-test; [b]derived from Mann Whitney; †difference was statistically significant (p<0.05)*

Before the intervention, there was no significant difference (*P*>0.05) in the students' mean calories, protein, and iron intake between the intervention and control groups. However, the difference was statistically significant at follow-up 1 (*P*<0.05), and it remained stable (p<0.05) at follow-up 2, as shown in Table 3.

Table 3: Comparison of dietary intake between intervention and control groups*

Dietary Intake	Before Intervention			Follow up-1			Follow-up 2		
	IG	CG	p-Value	IG	CG	P Value	IG	CG	P Value
Calories (kcal)	1421.1 (363.7)	1553.1 (369.4)	0.127[a]	1543.4 (28.5)	1343.0 (290.3)	0.002[b]†	1450.1 (192.9)	1201.2 (180.3)	<0.001[a]†
Protein (g)	32.3 (8.6)	36.2 (14.2)	0.360[b]	49.7 (6.7)	29.9 (8.4)	<0.001[b]†	42.0 (5.3)	27.7 (5.92)	<0.001[a]†
Iron (mg)	7.8 (2.2)	8.4 (2.1)	0.177[a]	12.1 (2.03)	7.7 (2.2)	<0.001[b]†	8.6 (1.4)	6.9 (1.9)	<0.001[a]†

**Data have been shown as mean(SD); IG= Intervention Group; CG= Control Group; [a]derived from t-test; [b]derived from Mann Whitney; †difference was statistically significant (p<0.05)*

DISCUSSION

The nutritional knowledge, HBM constructs, as well as dietary intake of calories, protein, and iron among students increased in the intervention group at follow-ups 1 and 2 compared to the baseline and control groups. The HBM theory can be used for various behaviors and different populations21. Furthermore, nutrition education based on the health belief model is more effective in improving nutritional behaviour than the traditional model22. This study's results are consistent with Parisa Keshani et al. that the use of HBM-based education in adolescents increased the nutritional knowledge and constructs scores of the intervention group. The diet quality of adolescents also improved in IG after the intervention19.

The results showed that nutrition education improved knowledge and HBM constructs in the IG after 4 and 12 weeks. The statistical tests also revealed that there was a difference in these parameters between the IG and CG at follow-ups 1 and 2 (P<0.05). Naghashpour et al. explored the effectiveness of HBM-based nutrition education in increasing knowledge, attitudes, and practices related to calcium intake among adolescent students. The results are in line with this current study that constructs and calcium intake scores were significantly higher after the intervention23. Tavakoli et al. revealed that nutrition promotion with the Heath Belief Model can positively increase knowledge, perceptions of HBM constructs, such as severity, barriers, benefits, and approaches to action, as well as healthy dietary habits. The changes observed four weeks after the intervention were the same as the observation in this study24.

The effects of the education were recorded four weeks after the intervention, and then re-measured after 12 weeks to determine the stability of the behavioral changes.

Furthermore, the results showed that the increase in the mean score of nutrition knowledge and HBM constructs

in the intervention group remained stable after 12 weeks. These findings are consistent with Ghedari et al. where there was also a significant increase in knowledge and HBM scores, such as perceived susceptibility, severity, benefits, and barriers, as well as self-efficacy after 12 weeks14.

The results showed that the dietary intake of energy, protein, and iron increased at follow-up 1 in IG, but decreased in CG. At follow-up 2, the nutritional consumption in IG decreased slightly but was still higher than the CG. The statistical analysis revealed that there was a difference in dietary intake at both follow-ups between the two groups (p<0.05). The increased consumption observed was because several determinants of behavior and knowledge were addressed using nutrition education based on HBM. Providing training about healthy food preparation for the cooks also played a role in these changes. The cooks are in charge of preparing the meals for the residents of the boarding school. Literature review of 28 studies showed that healthy meal preparation interventions and dietary intake have a positive impact among adults25. Similar results were also obtained in a previous study where they positively correlated with healthier diets in children26.

One of the limitations of this study is that the participants live in boarding schools, which implies that the results cannot be generalized to non-boarding school students. The small sample size of included studies was also a potential limitation. Although several confounding variables were calculated and controlled, others, such as preferred educational sessions and programs as well as health conditions while answering the questionnaire can affect the outcome. Further studies with a large sample size and more

confounding variables need to be carried out. One of the strengths of this study is the presence of the cooks as the person responsible for preparing meals at the school. Another strength was the measurement of two follow-up data 4 and 12 weeks after the education to evaluate its stability.

CONCLUSION

The results showed that there was an increase in dietary calories, protein, and iron intake after the intervention. Nutritional knowledge and construction scores of HBM were also significantly increased compared to the controls. HBM-based strategies combined with education on preparing healthy food can be recommended as an effective program to prevent anemia by increasing dietary iron intake among adolescent girls living in boarding schools.

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Conflict of interest
We declare we have no conflict of interest for this study.

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REFERENCES

1. WHO. Adolescent Health: The missing population in Universal Health Coverage. WwwWhoInt. Published online 2018:1-32. https://www.who.int/health-topics/adolescent-health#tab=tab_2

2. Haberland NA, McCarthy KJ, Brady M. A Systematic Review of Adolescent Girl Program Implementation in Low- and Middle-Income Countries: Evidence Gaps and Insights. J Adolesc Heal. 2018;63(1):18-31. doi:10.1016/j.jadohealth.2017.11.294

3. Mistry SK, Jhohura FT, Khanam F, Akter F, Khan S, Yunus F. An outline of anemia among adolescent girls in Bangladesh : findings from a cross- sectional study. Published online 2017:1-9. doi:10.1186/s12878-017-0084-x.

4. Kumari S, Garg N, Kumar A, et al. Maternal and severe anaemia in delivering women is associated with risk of preterm and low birth weight: A cross sectional study from Jharkhand, India. One Heal. 2019;8(July):100098. doi:10.1016/j.onehlt.2019.100098.

5. Thankachan P, Selvam S, Surendran D, et al. Efficacy of a multi micronutrient-fortified drink in improving iron and micronutrient status among schoolchildren with low iron stores in India: A randomised, double-masked placebo-controlled trial. Eur J Clin Nutr. 2013;67(1):36-41. doi:10.1038/ejcn.2012.188.

6. Mills S, White M, Wrieden W, Brown H, Stead M, Adams J. Home food preparation practices, experiences and perceptions: A qualitative interview study with photo-elicitation. PLoS One. 2017;12(8):1-18. doi:10.1371/journal.pone.0182842.

7. Soliah LAL, Walter JM, Jones SA. Benefits and barriers to healthful eating: What are the consequences of decreased food preparation ability? Am J Lifestyle Med. 2012;6(2):152-158. doi:10.1177/1559827611426394.

8. Reicks M, Kocher M, Reeder J. Impact of Cooking and Home Food Preparation Interventions Among Adults: A Systematic Review (2011–2016). J Nutr Educ Behav. 2018;50(2):148-172.e1. doi:10.1016/j.jneb.2017.08.004.

9. Hamulka J, Wadolowska L, Hoffmann M, Kowalkowska J, Gutkowska K. Effect of an education program on nutrition knowledge, attitudes toward nutrition, diet quality, lifestyle, and body composition in polish teenagers. The ABC of healthy eating project: Design, protocol, and methodology. Nutrients. 2018;10(10). doi:10.3390/nu10101439.

10. Fonseca LG, Bertolin MNT, Gubert MB, da Silva EF. Effects of a nutritional intervention using pictorial representations for promoting knowledge and practices of healthy eating among Brazilian adolescents. PLoS One. 2019;14(3):1-12. doi:10.1371/journal.pone.0213277.

11. Kalaian SA, Kasim RM. Effectiveness of various innovative learning methods in health science classrooms: a meta-analysis. Adv Heal Sci Educ. 2017;22(5):1151-1167. doi:10.1007/s10459-017-9753-6.

12. Ceber E, Turk M, Ciceklioglu M. The effects of an educational program on knowledge of breast cancer, early detection practices and health beliefs of nurses and midwives. J Clin Nurs. 2010;19(15-16):2363-2371. doi:10.1111/j.1365-2702.2009.03150.x.

13. Vahedian-shahroodi M. Predic ti on of Osteoporosis Preven ti ve Behaviors using the Health Belief Model. 2014;2(3):199-207.

14. Ghaderi N, Ahmadpour M, Saniee N, Karimi F, Ghaderi C, Mirzaei H. Effect of education based on the Health Belief Model (HBM) on anemia preventive behaviors among iranian girl students. Int J Pediatr. 2017;5(6):5043-5052. doi:10.22038/ijp.2017.22051.1844.

15. Nicholaus C, Martin HD, Kassim N, Matemu AO, Kimiywe J. Dietary Practices, Nutrient Adequacy, and Nutrition Status among Adolescents in Boarding High Schools in the Kilimanjaro Region, Tanzania. J Nutr Metab. 2020;2020(7):1-14. doi:10.1155/2020/3592813.

16. Anwar DF. Foreign Policy, Islam and Democracy in Indonesia. J Indones Soc Sci Humanit. 2010;3(1):37-54. doi:10.14203/jissh.v3i1.45.

17. Guilmoto CZ. Ananta, A., E. N. Arifin, M. S. Hasbullah, N. B. Handayani and A. Pramono, Demography of Indonesia's ethnicity . Asian Ethn. 2017;18(3):424-427. doi:10.1080/14631369.2016.1249653.

18. Agustina R, Nadiya K, El Andini A, et al. Associations of meal patterning, dietary quality and diversity with anemia and overweight-obesity among Indonesian schoolgoing adolescent girls in West Java. PLoS One. 2020;15(4):1-19. doi:10.1371/journal.pone.0231519.

19. Keshani P, Hossein Kaveh M, Faghih S, Salehi M. Improving diet quality among adolescents, using health belief model in a collaborative learning context: a randomized field trial study. Health Educ Res. 2019;34(3):279-288. doi:10.1093/her/cyz009.

20. FAO. Dietary Assessment.; 2018. https://www.fao.org/3/i9940en/I9940EN.pdf.

21. Carpenter CJ. A meta-analysis of the effectiveness of health belief model variables in predicting behavior. Health Commun. 2010;25(8):661-669. doi:10.1080/10410236.2010.521906.

22. Mohebi S, Shahnazi H, Shahsiah M, Sharifirad G, Tol A, Matlabi M. The effectiveness of nutrition education program based on health belief model compared with traditional training. J Educ Health Promot. 2013;2(1):15. doi:10.4103/2277-9531.112684.

23. Naghashpour M, Shakerinejad G, Lourizadeh MR, Hajinajaf S, Jarvandi F. Nutrition education based on health belief model improves dietary calcium intake among female students of junior high schools. J Heal Popul Nutr. 2014;32(3):420-429.

24. Tavakoli HR, Dini-Talatappeh H, Rahmati-Najarkolaei F, Gholami Fesharaki M. Efficacy of HBM-Based Dietary Education Intervention on Knowledge, Attitude, and Behavior in Medical Students. Iran Red Crescent Med J. 2016;18(11). doi:10.5812/ircmj.23584.

25. Reicks M, Trofholz AC, Stang JS, Laska MN. Impact of Cooking and Home Food Preparation Interventions Among Adults: Outcomes and Implications forFuture Programs. J Nutr Educ Behav. 2014;46(4):259-276. doi:10.1016/j.jneb.2014.02.001.

26. Chu YL, Storey KE, Veugelers PJ. Involvement in Meal Preparation at Home Is Associated With Better Diet Quality Among Canadian Children. J Nutr Educ Behav. 2014;46(4):304-308. doi:10.1016/j.jneb.2013.10.003