Jurnal Gizi dan Dietetik Indonesia
(Indonesian Journal of Nutrition and Dietetics)
Vol 12, Issue 3, 2024:187-198

Available online at: https://ejournal.almaata.ac.id/index.php/IJND
p-ISSN 2303-3045 e-ISSN 2503-183X
DOI: https://dx.doi.org/10.21927/ijnd.2024.12(3).187-198

WhatsApp-based intervention to promote tea consumption and healthy lifestyle in Indonesian's adult

Dodik Briawan[1,2], Linda Riski Sefrina[3*], Mira Dewi[1,2], Farida Dwi Rokhmah[1]

[1]Department of Community Nutrition, Faculty of Human Ecology, IPB University, Bogor, Indonesia, 11680,
[2]Southeast Asia Food and Agricultural Science and Technology (SEAFAST) Center, LPPM-IPB University, 11680, Indonesia
[3]Department of Nutrition, Faculty of Health Sciences, Singaperbangsa Karawang University, 41361, Indonesia

**Correspondence*: linda.riski@fkes.unsika.ac.id

ABSTRAK

Latar Belakang: *: Flavonoid yang terkandung dalam teh telah terbukti mengurangi risiko Penyakit Kardiovaskular, dan konsumsi teh dapat membantu mengurangi masalah tersebut di masyarakat. Sementara konsumsi teh di kalangan masyarakat Indonesia masih jarang dan dalam jumlah sedikit.*
Tujuan: *Tujuan dari penelitian ini adalah untuk mengevaluasi pengaruh intervensi pendidikan berbasis WhatsApp program "HaH (Heart at Home)" yang bertujuan untuk meningkatkan KAP (Knowledge, Attitude, Practice) untuk mencegah CVD dengan menerapkan pola hidup sehat dan mendorong konsumsi teh.*
Metode: *Subyek adalah perempuan/laki-laki yang sudah menikah, anggota YJI (Yayasan Jantung Indonesia), berusia 25-50 tahun, memiliki dan menggunakan ponsel dalam kehidupan sehari-hari. Jumlah subjek dalam penelitian ini sebanyak 80 orang. Desain penelitian adalah intervensi pre-post yang dilakukan secara online menggunakan WhatsApp selama 21 hari. Intervensi pada penelitian ini berupa postingan video/gambar dan diskusi online melalui WhatsApp. Uji Wilcoxon dan McNemmar digunakan untuk menguji perbedaan KAP subjek sebelum dan sesudah intervensi.*
Hasil: *Subjek terbanyak adalah perempuan (96,3%), berusia 25-40 tahun (78,8%), dan ibu rumah tangga (67,5%). Skor pengetahuan meningkat sekitar 17,5% ($p<0,05$). Lebih dari 10% subjek mengalami peningkatan pengetahuan terkait risiko CVD. Hampir seluruh subjek sudah memiliki sikap positif pada awal (94%) dan sedikit meningkat menjadi 97,0% ($p<0,05$). Setelah intervensi, praktik kesehatan positif seperti olahraga, konsumsi sayur, relaksasi, dan tidur meningkat, sedangkan praktik negatif seperti merokok, gejala stres, dan konsumsi makanan tinggi kolesterol mengalami penurunan.*
Kesimpulan: *Penelitian ini menunjukkan bahwa program online efektif meningkatkan KAP subjek, meskipun hal ini dapat dimaksimalkan dengan lebih banyak berinteraksi dengan subjek.*

KATA KUNCI*: hidup sehat; minum teh; pendidikan gizi; penyakit kardiovaskuler; WhatsApp*

ABSTRACT

Background: *Tea flavonoids have been shown to reduce Cardiovascular Disease (CVD) risks, and tea consumption might help reduce the problem in the community. Meanwhile, tea consumption among Indonesian people is still rare and in small quantities.*

Objectives: *This research aimed to evaluate the effect of a WhatsApp-based education intervention, "HaH (Heart at Home)," a program that aims to increase KAP (Knowledge, Attitude, Practice) to prevent CVD by practicing a healthy lifestyle and encouraging tea consumption.*

Methods: *Subjects were women/men who are married, members of IHF (Indonesia Heart Foundation), aged 25-50 years old, own and used a smartphone in their daily life. A total of 80 adults was participated in this study. The study design was pre-post intervention conducted online using WhatsApp for 21 days. The intervention included videos/ picture posts and online discussion through WhatsApp. Wilcoxon and McNemmar tests were used to examine the differences in subjects' KAP before and after the intervention.*

Results: *Most subjects were women (96.3%) aged 25-40 years (78.8%) and housewives (67.5%). The knowledge score increased by about 17.5% ($p<0.05$). More than 10% of subjects increased their knowledge of CVD risk. Almost all subjects already had a positive attitude at baseline (94%) and was slightly increased to 97.0% ($p<0.05$). After the intervention, positive health practices such as exercise, consuming vegetables, relaxation, and sleep were increased. In contrast, harmful practices such as smoking, stress symptoms, and consuming high-cholesterol food were decreased.*

Conclusions: *The present study showed that an online program effectively increases the KAP of subjects, although this can be maximized by having more interaction with subjects.*

KEYWORD*:* *coronary vascular disease; drinking tea; healthy lifestyle; WhatsApp-based education*

Article info:
Article submitted on October 3, 2023
Articles revised on March 15, 2024
Articles received on May 20, 2024

INTRODUCTION

The prevalence of Non-Communicable Diseases (NCDs), particularly Cardiovascular-Diseases (CVDs), increases yearly in the world, including Indonesia. Worldwide, CVD prevalence has increased from 271 million in 1990 to 523 million in 2019 (1). In Indonesia, the prevalence is also increasing. In the past 15 years, stroke prevalence has increased from 7.0‰ in 2013 to 10.9‰ in 2018. Likewise, the prevalence of hypertension increased from 25.8% in 2013 to 34.1% in 2018 (2). The diseases are closely associated with unhealthy lifestyles; hence, dietary modification has been proposed as one of the strategies to reduce the prevalence.

A previous study has shown that consuming foods rich in antioxidants protects blood vessels and prevents CVD (3). Flavonoid is a subclass of phytonutrients that humans widely consume, and its function as an antioxidant is correlated with free radical-fighting properties, which has been shown to reduce the risk of NCDs. A study conducted among subjects aged 19 years showed that flavonoid intake was able to reduce the risk of cancer by 41%, Coronary Heart Disease (CHD) by 18%, hypertension by 9%, Diabetes Mellitus by 8%, heart failure by 19%, and stroke by 10% (4–8). Research in the United States showed that intake of flavonoids of more than 359.7 mg/day reduced the risk of cardiovascular disease by 38% (9). The estimation of the flavonoid intake of Indonesians was predicted to be only 25.02 mg/day (10). Recent studies have also shown that the intake of flavonoids in Kendari and Karawang Regency is 142.26 mg/day and 171.9 mg/day, respectively (11,12). These results indicate that the amount of flavonoid intake is lower than the

suggested amount needed to prevent and reduce the risk of CVD.

The alternative to increasing flavonoid intake is increasing the beverage consumption of flavonoid sources such as tea. Tea is a source of flavonoids containing 118.35 mg/100 g (11). Tea can improve nitric oxide status and endothelial function, significantly mediating blood vessel dilatation (13). The habit of drinking tea has a lower risk of CHD, which is proven by a study in China that showed that people who consume tea at least 236.6 mL/day had a 4% lower risk of CVD mortality and a 2% lower risk of CVD (14). Recent studies depict that people consume tea for various reasons, including as a thirst quencher, to socialize with close people or colleagues, to fill their spare time, as a work partner, or because of its benefits related to health (15–18).

Although tea is the most consumed beverage in Indonesia, only about 30% of Indonesians consume tea, with an average consumption per person of 1.6 g/day (19). Leonardo et al. (2017) revealed that tea consumption per capita in Indonesia has decreased significantly compared to 2002, which reached 0.77 kg/cap/year to 0.18 kg/cap/year (20). This low tea consumption is affected by inadequate knowledge about tea (21,22). Proper knowledge and attitude toward nutrition are essential factors in implementing dietary habits (23). Knowledge improvement needs comprehensive steps. For instance, promoting systematic intervention using the findings and other evidence-based practice into routine practice will increase the quality and effectiveness of health services (24). In the implementation process, knowledge develops a positive attitude toward health behavior. Thus, this positive attitude can maintain and increase healthy dietary habits (23).

Recently, after the covid-19 pandemic, most people could use social media more quickly, including WhatsApp (25,26). By July 2022, WhatsApp will be the third most-used social media in the world. Nowadays, most people look for the information they need through the internet. In a study by Kranthi (2021), most subjects used WhatsApp to access their health information (27).

These facts established the impact of WhatsApp on the communities' daily lives. Related to this advantage, nutrition education using WhatsApp has enormous opportunities to empower the community. The digitalization of nutrition education has been widely used worldwide (25). Unfortunately, the studies that discussed education intervention to knowledge, attitude, and practice correlated to the antioxidant intake, particularly tea consumption, was still limited. Therefore, it is necessary to implement a nutrition education program to improve behavior (knowledge, attitudes, and practices) about the benefits and consumption of tea in the prevention of CVD. PT initiated the "Heart at Home" (HaH) program. Unilever Indonesia participated in reducing the incidence of CHD in Indonesia through a family approach. This study aimed to identify the effectiveness of nutrition education to improve knowledge, attitude, and practice through the HaH program.

MATERIALS AND METHODS

Design

To investigate the effect of the HaH program, a pre-post intervention study involving one group was conducted. Data were collected through a self-reported questionnaire using the online questionnaire Google Forms. This study was conducted from August to September 2022.

Subjects

The subjects of the study were a couple who were members of the Indonesian Heart Foundation (Yayasan Jantung Indonesia). The subjects in this study were chosen using accidental sampling. Based on the formula of Lemeshow for experimental study, a minimum of 114 people as the subjects were needed. All subjects were assessed prior to the start of the program and a day after completing the HaH Program. The complete steps of subject recruitment were performed in Figure 1. The assessment before the intervention was divided into two steps. First of all, the subjects' data are collected, including their socio-demographic background and their willingness to join the program, using an online questionnaire (Google Form) and informed consent. This step was performed to filter the subjects who were eligible for the study based on the following inclusion criteria: (1) Member of the Indonesian Heart Foundation; (2) aged 25-50 years; (3) already married. Secondly, the pre-test

questionnaire was used to assess the baseline knowledge, attitude, and behavior of healthy lifestyles and tea consumption of the subjects. The total of people who filled out this questionnaire was 259, and we excluded 106 ineligible people based on the screening test at first. Hence, the total of 153 subjects were participated in the baseline. The number of these subjects at baseline was more than the minimum sample. During the intervention, 73 subjects were excluded by the reason of their absence (**Figure 1**).

Intervention

The intervention given in the HaH program was nutrition education with three indicators to be identified they were Knowledge, Attitudes, and Practices (KAP). The program provided information related to a healthy lifestyle, mainly to prevent CHD. All of the materials were provided with infographics and a comprehensive explanation through the WhatsApp Group. Its material was delivered through WhatsApp Group for 21 days with seven topics:

1. The role of the partner in the health of the family
2. The most dangerous disease in Indonesia
3. The factors that correlated with cholesterol and heart disorders
4. Heart at Home Program
5. Healthy lifestyle
6. The myths and facts about tea
7. Daily healthy beverages menu

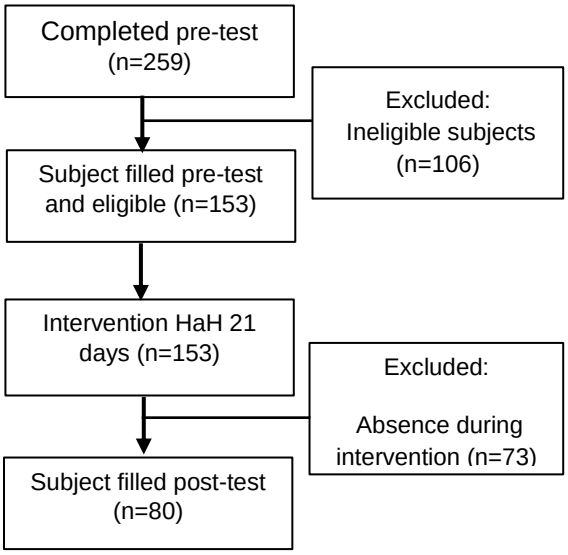

Figure 1. Flowchart of the subjects' recruitment

In this study, all of the subjects were divided into 10 WhatsApp Groups. Each groups contain 15-16 subjects. The subjects for each group were selected randomly. One field coordinator handled each group. While nutrition education was carried out, the field coordinator checked the presence of subjects by viewing uploaded photos in a small group of WhatsApp every day, then administrated them on Google Sheets for subjects who attended and uploaded photos every day. The photos shared in the Whatsapp group vary per day, depending on the educational material provided.

In addition, to providing the educational materials, during the intervention period, subjects were also given the challenge to serve and drink tea for themselves and their families according to the educational materials provided, which were uploaded via Instagram. Uploading photos on Instagram must also add a caption and Hashtag #HeartAtHomeSariwangiYJI, which was uploaded on Saturday for each week. A method to maintain the compliance of the subjects was determined by how often they opened WhatsApp Groups for "Heart at Home" activities. In the WhatsApp Group, subjects received educational materials and interacted with the facilitator. As many as 85% of subjects stated that they had never failed to open the WhatsApp Group, and only 11.3% had failed to open it twice (days) during the 21 days of the program. During the program, 13 educational material infographics were delivered by the administrator of the WhatsApp Group. The average number of infographics that subjects had never read was 3.6 ± 3.8 materials. Regarding the use of this media, 20% of subjects had never read 7-13 infographics.

Questionnaire Development.

The structured questionnaire was applied to collect data. The socioeconomic and demographic characteristics were collected only at baseline. Knowledge, attitude, and practices regarding healthy lifestyle were collected at both baseline and end line by using 15, 15, and 10 questions, respectively. A questionnaire to measure nutritional knowledge, attitude, and practice was tested for validity and reliability before being used. The test was conducted online on 41 people with similar characteristics to the subjects. In this study, Cronbach's alpha test was performed at 0.586, and the Pearson correlation was 0.510; thus, the

questionnaire that was used was valid and reliable.

Nutritional knowledge was assessed with 15 close-end questions with four multiple-choice answers. For all questions, the correct answer is given 1 point, and the others get 0 points. The total score ranged from 0 to 15 points, with higher scores meant higher nutritional knowledge. The questions of the questionnaire were based on the topic that was explained during the intervention. The categorization of knowledge was divided into three levels according to the percentage of correct answers: "low" (<60%), "moderate" (60-80%), and "high" (>80%) (28). The attitude assessment contained 13 positive statements and two opposing statements. The answers for each clause were provided as "disagree," "neutral," and "agree ."The scores were given based on their type (positive or negative). In a positive statement, each item is composed of 3 levels' answers ("agree," "neutral," and "disagree") corresponding to 1, 2, and 3 scores, respectively. In contrast, negative statements were given the opposite scores with positive statements. The total score was ranging from 15 to 45. The attitude of the subjects was categorized based on total score as "positive" (>80%), "neutral" (60-80%), and "negative" (<60%) (29). In the practice dimension, the questions on the questionnaire had multiple-choice answers according to specific purposes and references.

Data Analysis

The statistical analysis was performed to evaluate the KAP baseline (before intervention) and end line (after intervention). All of the data were analyzed by the statistical software SPSS (version 20.0). The numeric data of this study were not normally distributed; thus, the non-parametric tests were chosen. A Wilcoxon test was used to compare the KAP baseline and end line with a numeric scale. The Mc-Nemmar test was used for the variable with the categorical scale. The test level was as follows: α =0.05, with a 95% Confidence Interval.

RESULTS AND DISCUSSIONS

The primary purpose of this program was to educate subjects about the prevention of Coronary Heart Disease (CHD) through WhatsApp. In addition, we also collected data about the subjects' medical history. However, all subjects in this program stated that they did not have parents at risk for heart disease and had never been diagnosed with CHD (Table 1). Subjects in the "Heart at Home" program who filled out both baseline and end-line questionnaires were 80 subjects. Almost half of the subjects were excluded because of their absence during the 21-day intervention. It showed low motivation among the subjects. Nutrition education is a step of the learning process, which is affected by intrinsic motivation and extrinsic motivation. Both of these motivations were positively related to subjects' engagement level in learning (30). Motivation is the process by which goal-directed behaviors are started and maintained. According to the expectancy-value theory, motivation is a function of perceived value and success expectations. The focus of attribution theory is on the causal explanations that students construct to explain the outcomes of activity, and it categorizes these explanations according to their locus, stability, and controllability (31). The average age of the subjects was 31 years, with an age range of 25-50 years. Most of the subjects (78.8%) were in the age group of 25-40 years. The mean oldest member of the family was 48 years old, with the maximum age in the family being 77 years old. The low participation of the elderly was correlated with demographic factors, internal factors, environmental or infrastructure, and the social network they had; hence, the participation of the elderly in this study is less than that of adults (32,33). Previous studies showed that social participation in the elderly is beneficial to improving their cognitive function and well-being and also serves as a mediator for better quality of life (34,35).

However, most of the subjects (58.9%) came from West Java and DKI Jakarta. The other subjects (less than 10%) came from Sumatra, Central Java, East Java, Bali, and Nusa Tenggara Barat (NTB). This result showed that the motivation to participate in educational activities still tends to be more in urban communities than in rural communities. A systematic review study revealed that urban inhabitants have more health literacy than rural ones (36). Chen et al. (2018) stated that the barriers in rural areas to getting healthy information are structural barriers and

Characteristics	n	%
Age		
Adults (25-40 years old)	63	78.8
Pre-elderly (41-50 years old)	17	21.3
Gender		
Female	77	96.3
Male	3	3.8
Districts		
Sumatera	8	10.0
West Java and Jakarta	47	58.8
Central Java and Yogyakarta	9	11.3
East Java, Bali, and Nusa Tenggara Barat	16	20.0
Occupation		
Housewife	54	67.5
Entrepreneur	17	21.3
Private employee	9	11.3
Educational background		
Elementary school	1	1.3
Junior high school	5	6.3
High school	41	51.3
College	33	41.3
Monthly expenses (Rupiah)		
< 1 million	13	16.3
1-2 million	30	37.5
2-3 million	19	23.8
3-4 million	12	15.0
>4 million	6	7.5
Number of family members		
<3	15	15.0
4-5	50	50.0
>5	15	15.0
Total	**80**	**100.0**

limited mass media (37). According to that study, rural residents prefer to access healthy information from search engines and family, unlike urban residents who can gain the information through the communities or corporations (37). As we know, health literacy is a step toward empowering individuals and communities to have more advantages over a variety of social and environmental factors that affect their health (38). Low health literacy can be an obstruction to accessing and accepting appropriate and safe health care (39). Furthermore, the present study used digital technology to deliver the information, so there might be barriers to technology, like mobile phone or internet services were not available or reliable in some rural areas. The socio-economic and demographic characteristic profiles of subjects are presented in Table 1. Almost all subjects (96.3%) were female. The gender distribution of the present study was similar to a previous study, which was 72.2% female and 27.8% male subjects (40). The average amount of participating family members is 4 people, with a fairly wide age range between 2-9 family members. For the occupation, most of the subjects were housewives (67.5%), this might be because the majority of subjects were women. The rest of the subjects' jobs were entrepreneurs (21.3%) and private employees (11.3%). Half of the subjects graduated from high school (51.3%) and 41.3% of subjects graduated from college. The subjects who graduated from elementary school and junior high school were fewer than those from high school and college. According to previous studies, the dissemination of health information was associated with education level, this was related to their motivation and their capability to accept and implement the knowledge from the nutrition education process (41,42). The range of spending money for monthly expenses in

the program was quite wide, the majority (61.3%) were between 1-3 million rupiah per month, 16.3% of subjects had monthly spending of less than 1 million, and 7.5% spent more than 4 million (equivalent to the minimum wage in urban cities). This result is similar to the average expenditure per capita of Indonesia's population, which was for about 1.3 million rupiah, based on the Consumption Expenditure of Population of Indonesia (2022). Table 2 revealed that the knowledge of the subjects in the end line, both based on categorization and average, was more significant than the baseline (p-value <0.05). Based on the knowledge category, there was a significant decrease in the number of subjects who were "low" from 50% to 29%. On the other hand, there was an increase in the number of subjects whose knowledge was "good" from 6% to 24% and those with "moderate" knowledge from 44% to 47%. Based on the results of the Mc-Nemmar Test, the change in the proportion of changes in the number of subjects whose knowledge improved was statistically very significant (p<0.05). In addition, the significant increase in knowledge (p <0.05) was due to the intervention based on the mean ± SD value, which was initially 56±17 to 68±17. The median value of the knowledge score of subjects before the program was 57 (min-max: 20-90). Meanwhile, the end-line knowledge score was 67 (min-max: 20-100). That result is quite different from the attitude since, at the baseline, most of the subjects had a positive attitude. Even so, there are significant differences in the attitudes of the subjects based on the average value and standard deviation (p-value <0.001).

Table 2. The Differences of Knowledge and Attitude Before and After the Program

Variable	Baseline		End line		*p*-value
	n	%	n	%	
Knowledge					
Low	40	50	23	29	<0.001[a]
Moderate	35	44	38	47	
High	5	6	19	24	
Mean±SD	56 ±17		68 ± 17		<0.001[b]
Median (Minimum-Maximum)	57 (20-93)		67 (20-100)		
Attitude					
Negative	0	0	0	0	0.250
Neutral	5	6	2	3	
Positive	75	94	78	97	
Mean±SD	90±7		93±6		<0.001[b]
Median (Minimum-Maximum)	91 (66-100)		94 (71-100)		

[a] Significance at *p*-value < 0.05 based on Mc-Nemmar Test
[b] Significance at *p*-value < 0.05 based on Wilcoxon Test

The results of this study were in accordance with the research of Wardhani et al. (2021), which showed that providing nutrition education interventions through the WhatsApp Group was able to increase subjects' nutritional knowledge (43). Knowledge is the result of humans sensing an object through the senses, especially the senses of sight and hearing. Knowledge is also an important domain in the formation of open behavior (44). Its mechanism is affected by the role of knowledge in self-awareness empowerment so that someone would behave according to the knowledge they have. Behavior changes related to knowledge improvement, awareness, and positive attitudes were more lasting because they were based on their awareness and not coercion (45).

Tabel 3.The Difference of Practices Before and After the Program

	Questions	Baseline [n(%)]	Endline [n(%)]	*p*-value
1	How many times did you exercise for 30 minutes during the past week?			
	Never	1 (1.2)	0	0.004*
	1-2 times/week	30 (37.5)	18 (22.5)	
	3-5 times/ week	41 (51.2)	49 (61.2)	
	>5 times/ week	8 (10.0)	13 (16.2)	
2	How many times have you smoked in the past week?			
	Never	73(91.2)	77 (96.2)	0.096
	Once time/week	4 (5.0)	1 (1.2)	
	2-4 times/week	3 (3.8)	2 (2.5)	
3	How many times have you eaten vegetables in the past week?			
	Never	1 (1.2)	0	0.004*
	1-3 times/week	15 (18.8)	5 (6.2)	
	4-6 times/ week	22 (27.5)	29 (36.2)	
	1-3 times/ day	42 (52.5)	46 (57.5)	
4	How many times have you eaten fruits in the past week?			
	Never	1 (1.2)	0	0.006*
	1-3 times/week	20 (25.0)	12 (15.0)	
	4-6 times/ week	28 (35.0)	30 (37.5)	
	1-3 times/ day	31 (38.8)	38 (47.5)	
5	How have you experienced stress symptoms (sleep difficulties, gastric disorders, anxiety, sadness, etc) during the last month?			
	Never	11 (13.8)	19 (23.8)	0.001*
	1-3 times/ month	40 (50.0)	51 (63.8)	
	≥4 times/month	29 (36.2)	10 (12.5)	
6	How many times have you done relaxation to reduce/remove stress during the past month?			
	Never	2 (2.5)	6 (7.5)	0.870
	1-3 times/ month	36 (45.0)	29 (36.2)	
	≥4 times/month	42 (52.5)	45 (56.3)	
7	How many times did you get enough sleep (7-9 hours/day) during the past week?			
	Never	1 (1.2)	1 (1.2)	0.117
	1-3 times /week	59 (73.8)	51 (63.8)	
	Everyday	20 (25.0)	28 (35.0)	
8	How many times have you eaten sources of cholesterol (fried, meat, coconut milk foods/drinks) during the past week?			
	Never	0	2 (2.5)	0.073
	1-6 times /week	72 (90.0)	74 (92.5)	
	Once /day	6 (7.5)	4 (5.0)	
	≥2 times /day	2 (2.5)	0	
9	How many times did you drink tea in the past week?			
	Never	2 (2.5)	0	0.010*
	1-6 times /week	46 (57.5)	34 (42.5)	
	Once /day	25 (31.2)	37 (46.2)	
	≥2 times /day	7 (8.8)	9 (11.2)	
10	How much money did you spend on tea in the past week?			
	0-9.000 rupiah	21 (26.2)	50 (62.5)	0.000*
	9.001-14.500 rupiah	19 (23.8)	12 (15.0)	
	14.501-23.750 rupiah	20 (25.0)	11 (13.8)	
	>23.750 rupiah	20 (25.0)	7 (8.8)	

*Significance at *p*-value < 0.05 based on Mc-Nemmar Test

*paired t-test results significantly different between measurements;[1]*independent test*;[2]*paired t-test*

Table 3 revealed the comparison of practice before and after intervention. The practice of exercising 30 minutes with a frequency of 3-5 times/week in the end line increased by 10%, and exercise frequency > 5 times/week was increased by 6.2%. Vegetable consumption practices increased by 5% at a frequency of consumption of 1-3 times/day and 8.7% at a frequency of consumption of 4-6 times/week. Fruit consumption practices increased by 8.7% at a frequency of consumption of 1-3 times/day and 2.5% at a frequency of consumption of 4-6 times/week. Although there was no significant difference in the practice of relaxing the subjects, there was a tendency to increase the frequency of relaxation by around 3-8% and the increase in the frequency of sufficient sleep (7-9 hours) by subjects by around 10%. Likewise, there was an increase in the average frequency of drinking tea from 5.1 times/week to 7.1 times/week. Hence, there are six categories of practices with significant changes.

Furthermore, during the program, the subjects were also asked to take photos of the activity of a healthy lifestyle and serve tea at home. The average frequencies of subjects

share photos to the WhatsApp Group 1.3 times with a range of 0-21 times. It means that there was indeed very diverse participation between the subjects. In this case, some subjects never sent any photos of their activities. Uploading these photos to Instagram apparently could not be used as an indicator of participation because not all subjects have Instagram accounts; 53.8% of subjects never uploaded photos to Instagram. Hence, many subjects only uploaded them to WhatsApp Groups.

In this study, there were several components used in the assessment of nutritional knowledge. These components consisted of exercise, smoking, stress, vegetable consumption, fruit consumption, consumption of food sources of fat, sleep, and relaxation. Changes in subjects' knowledge that were quite significant, the awareness improvement after the program including the risk of CHD due to smoking and lack of exercise, as well as the CHD protective effect by consuming vegetables/fruits and reducing oil. These results indicate that the research subjects were able to receive, understand, and recognize the information provided.

The educational process provides an opportunity for a person or community to learn and try to understand or deepen knowledge (46). In this study, information related to nutrition was presented in the infographics. The frequency of giving messages was carried out every day for 21 days; the concept of this activity was able to increase exposure and understanding of the information provided so that there was a significant increase in the knowledge value of the subjects. Attitude is a psychological construction, a mental and emotional entity that is attached to or characterizes a person, which shows a personal view of something. Attitude involves a person's mindset, views, and feelings obtained from experience (47,48). In the present study (Table 2), most of the subjects (94%) already had a positive attitude toward the risk factors for CHD and their preventive behavior before the program started. After giving the program, there was only a slight increase (p-value >0.05) of subjects with a positive attitude (from 94% to 97%). However, based on the median attitude score, there was a significant change after the program started, from a score of 91 to 94 (p-value <0.05). Based on the assessment of the answers, quite a lot of positive attitude changes were found in the statements about drinking tea for family time, acceptance of packaged tea, approval of tea as CHD prevention, and feeling relaxed effects after drinking tea. This result was in line with previous research, which showed that giving booklets was able to improve the attitudes of the subjects significantly (49).

In this study, there was an increase in CHD prevention practices after the program. It was indicated by a significant increase in sports activity, vegetable consumption, fruit consumption, relaxation, enough sleep, and drinking tea (p-value <0.05). Furthermore, practices that significantly decreased (p-value<0.05) were the frequency of stress symptoms and money to buy tea. The decrease in money spent on tea might be influenced by the provision of kits in the form of tea as one of the facilities during the intervention. In addition, there was a reduction in smoking rates, stress symptoms, and consumption of foods high in cholesterol. The frequency of smoking decreased by about 1-5% in the post-test compared to the pre-test.

In general, the results of this study indicate that the Heart at Home program is capable of facilitating behavior change in program subjects. A person's behavior is influenced by predisposing factors such as knowledge, attitudes, beliefs, values, and perceptions (48). Previous research has shown that knowledge and attitudes can increase motivation for behavior change. An approach based on principles involving subjects' participation can help them to identify individual barriers, motivate subjects, and improve their ability to act (50).

Nutrition education is an alternative to increase health literacy in the community. This activity provides subjects with cognitive and social skills. These skills support the improvement of individual motivation and abilities in increasing access so that subjects can understand and use information with the aim of improving health (51). Health literacy can increase awareness about health and can facilitate individuals to modify health determinants.

The limitation of this study was the low subject compliance. However, when the intervention was implemented, subject absences were greater than expected. Although methods to maintain subject compliance have been implemented, many subjects do not actively participate daily. The lack of face-to-face meetings during the intervention period may have had an impact on this, therefore it can be challenging to establish effective communication. However, because the findings of the statistical analysis provide a clearer picture of the phenomena that occurred during the intervention, we think it is important to describe these phenomena. As a final point, we emphasize that although interventions can result in changes in knowledge, attitudes, and practices, much research remains to be done regarding the multifactorial elements of these measures.

CONCLUSIONS AND RECOMMENDATIONS

The subjects' knowledge of the prevention of CVD improved significantly after the HaH program. Meanwhile, attitudes towards an effort to prevent CVD had a slight increase. There were 20-25% of the subjects agreed that consuming tea would make them feel more relaxed. Inclining practice scores were shown by additional time spent exercising, consuming more vegetables, relaxing, and having enough sleep. There was a declining score for smoking, having stress symptoms, and consuming high-cholesterol food. The frequency of tea consumption also rose from 5.1 times/week to 7.1 times/week. There is a need to increase knowledge by educating the community, which can be done online or offline to increase awareness of CVD risk factors.

ACKNOWLEDGEMENT

This work was funded and supported by Sariwangi PT. Unilever Indonesia. The authors thank to the Indonesia Heart Foundation (Yayasan Jantung Indonesia) and all of the subjects for contributing to this study.

REFERENCES

1. Roth GA, Mensah GA, Johnson CO, Addolorato G, Ammirati E, Baddour LM, et al. Global Burden of Cardiovascular Diseases and Risk Factors, 1990-2019: Update From the GBD 2019 Study. J Am Coll Cardiol. 2020;76(25):2982–3021.
2. Health Ministry of Indonesia. Basic Health Research of Indonesia 2018. Health Ministry of Indonesia. Jakarta: Balitbangkes Kemenkes RI; 2018. p. 198.
3. Khan J, Deb PK, Priya S, Medina KD, Devi R, Walode SG, et al. Dietary flavonoids: Cardioprotective potential with antioxidant effects and their pharmacokinetic, toxicological and therapeutic concerns. Molecules. 2021;26(13):1–24.
4. Mink PJ, Scrafford CG, Barraj LM, Harnack L, Hong C-P, Nettleton JA, et al. Flavonoid intake and cardiovascular disease mortality : a prospective study in. Am J Clin Nutr [Internet]. 2014;85(3):895–909. Available from: http://ajcn.nutrition.org/content/85/3/895.long
5. Zamora-Ros R, Knaze V, Luján-Barroso L, Kuhnle GGC, Mulligan AA, Touillaud M, et al. Dietary intakes and food sources of phytoestrogens in the European Prospective Investigation into Cancer and Nutrition (EPIC) 24-hour dietary recall cohort. Eur J Clin Nutr. 2012 Aug;66(8):932–41.
6. Lajous M, Rossignol E, Fagherazzi G, Perquier F, Scalbert A, Clavel-Chapelon F, et al. Flavonoid intake and incident hypertension in women. Am J Clin Nutr. 2016;103(4):1091–8.
7. Wedick NM, Pan A, Cassidy A, Rimm EB, Sampson L, Rosner B, et al. Dietary flavonoid intakes and risk of type 2 diabetes in US men and. 2012;(5).
8. Cassidy A, Rimm EB, O'Reilly ÉJ, Logroscino G, Kay C, Chiuve SE, et al. Dietary flavonoids and risk of stroke in women. Stroke. 2012;43(4):946–51.
9. McCullough ML, Peterson JJ, Patel R, Jacques PF, Shah R, Dwyer JT. Flavonoid intake and cardiovascular disease mortality in a prospective. Cancer. 2012;454–64.
10. Sefrina LR, Briawan D, Sinaga T, Permaesih D. Estimation of Flavonoid and Carotenoid Intake in Indonesian Adults. IPB University. 2017.
11. Sefrina LR, Rahmatunisa R. Estimation of Total Dietary Flavonoid Intake on Health and Non-Health Students in Karawang. 2020;1(September):18–24.
12. Nasruddin NI, Novi Silvia Hardiany, Wiji Lestari. Flavonoid intake and its correlation to malondialdehyde serum among reproductive-aged women with obesity. World Nutr J. 2022;5(i2):8–17.
13. Hodgson JM, Croft KD. Tea flavonoids and cardiovascular health. Mol Aspects Med [Internet]. 2010;31(6):495–502. Available from:

http://dx.doi.org/10.1016/j.mam.2010.09.004
14. Chung M, Zhao N, Wang D, Shams-White M, Karlsen M, Cassidy A, et al. Dose-Response Relation between Tea Consumption and Risk of Cardiovascular Disease and All-Cause Mortality: A Systematic Review and Meta-Analysis of Population-Based Studies. Adv Nutr. 2020;11(4):790–814.
15. Nugraha A, Sumarwan U, Simanjuntak M. Determinant Factors of Preferences and Behavior about Black and Geen Tea Consumption. J Manaj dan Agribisnis. 2017;14(3):198–208.
16. Mariani DY, Rejamardika YN. Descriptive Analysis about Tea Lifestyle of Citizens in Hare and Hatter Cabang Surabaya Town Square. Hosp dan Manaj jasa. 2013;1:450–7.
17. Candra AA, Setiawan B, Rizal M, Damanik M. Impact of Snacks Giving, Nutrition Education and Iron Supplementation. J Gizi dan Pangan [Internet]. 2013;8(2):103–8. Available from: http://ilkom.journal.ipb.ac.id/index.php/jgizipangan/article/view/7680/5949
18. Sumi RS, Kabir G. Factors affecting the buying intention of organic tea consumers of Bangladesh. J Open Innov Technol Mark Complex. 2018;4(3).
19. Health Ministry of Indonesia. Total Diet Study : Individual Food Consumption Survey. 2014. 1–7 p.
20. Leonardo F, Taufik NI, Rianawati D. Characteristis Analysis of Tea Drinker in Bandung. J Akunt Maranatha. 2019;11(1):77–97.
21. Nash LA, Ward WE. Tea and bone health: Findings from human studies, potential mechanisms, and identification of knowledge gaps. Crit Rev Food Sci Nutr. 2017;57(8):1603–17.
22. Chambers D, Phan UTX, Chanadang S, Maughan C, Sanchez K, Di Donfrancesco B, et al. Motivations for food consumption during specific eating occasions in Turkey. Foods. 2016;5(2):1–14.
23. Hakli G, Asil E, Uçar A, Özdogan Y, Yilmaz MV, Özçelik AÖ, et al. Nutritional knowledge and behavior of adults: Their relations with sociodemographic factors. Pakistan J Nutr. 2016;15(6):532–9.
24. Wensing M, Grol R. Knowledge translation in health: How implementation science could contribute more. BMC Med. 2019;17(1):1–6.
25. González-Padilla DA, Tortolero-Blanco L. Social media influence in the COVID-19 pandemic. Int Braz J Urol. 2020;46(Suppl 1):120–4.
26. Tsao SF, Chen H, Tisseverasinghe T, Yang Y, Li L, Butt ZA. What social media told us in the time of COVID-19: a scoping review. Lancet Digit Heal [Internet]. 2021;3(3):e175–94. Available from: http://dx.doi.org/10.1016/S2589-7500(20)30315-0
27. Kranthi VSMK, Pratap KVNR, Padma TM, Sivakalyan V, Kumar VS. Health Apps : Its Impact On Health Care Students in Telangana – A Cross Sectional KAP Study. 2021;4(3):35–7.
28. Simanjuntak BY, Haya M, Suryani D, Khomsan A, Ahmad CA. Maternal knowledge, attitude, and practices about traditional food feeding with stunting and wasting of toddlers in farmer families. Kesmas. 2019;14(2):58–64.
29. Prasetya G, Khomsan A. The Knowledge, Attitude and Practice of Mothers and Children on the Indonesian Dietary Guidelines and the Relationship with Children's Nutritional Status. J Gizi Dan Pangan. 2021;16(1):55–64.
30. Fan W, Williams CM. The effects of parental involvement on students' academic self-efficacy, engagement and intrinsic motivation. Educ Psychol. 2010 Jan;30(1):53–74.
31. Cook DA, Artino AR. Motivation to learn: an overview of contemporary theories. Med Educ. 2016 Oct 1;50(10):997–1014.
32. Liu J, Rozelle S, Xu Q, Yu N, Zhou T. Social engagement and elderly health in China: Evidence from the China health and retirement longitudinal survey (CHARLS). Int J Environ Res Public Health. 2019 Jan 2;16(2).
33. Townsend BG, Chen JTH, Wuthrich VM. Barriers and Facilitators to Social Participation in Older Adults: A Systematic Literature Review. Vol. 44, Clinical Gerontologist. Routledge; 2021. p. 359–80.
34. Mikkelsen ASB, Petersen S, Dragsted AC, Kristiansen M. Social interventions targeting social relations among older people at nursing homes: A qualitative synthesized systematic review. Vol. 56, Inquiry (United States). SAGE Publications Inc.; 2019.
35. Anatürk M, Demnitz N, Ebmeier KP, Sexton CE. A systematic review and meta-analysis of structural magnetic resonance imaging studies investigating cognitive and social activity levels in older adults. Vol. 93, Neuroscience and Biobehavioral Reviews. Elsevier Ltd; 2018. p. 71–84.
36. Aljassim N, Ostini R. Health literacy in rural and urban populations: A systematic review. Vol. 103, Patient Education and Counseling.

Elsevier Ireland Ltd; 2020. p. 2142–54.
37. Chen X, Orom H, Hay JL, Waters EA, Schofield E, Li Y, et al. Differences in Rural and Urban Health Information Access and Use. J Rural Heal. 2019 Jun 1;35(3):405–17.
38. Cajita MI, Cajita TR, Han HR. Health literacy and heart failure a systematic review. Vol. 31, Journal of Cardiovascular Nursing. Lippincott Williams and Wilkins; 2016. p. 121–30.
39. Ruiz LD, Zuelch ML, Dimitratos SM, Scherr RE. Adolescent obesity: Diet quality, psychosocial health, and cardiometabolic risk factors. Vol. 12, Nutrients. MDPI AG; 2020.
40. Özenoğlu A, Çevik E, Çolak H, Altintaş T, Alakuş K. Changes in nutrition and lifestyle habits during the COVID-19 pandemic in Turkey and the effects of healthy eating attitudes. Med J Nutrition Metab. 2021;14(3):325–41.
41. Julia C, Péneau S, Buscail C, Gonzalez R, Touvier M, Hercberg S, et al. Perception of different formats of front-of-pack nutrition labels according to sociodemographic, lifestyle and dietary factors in a French population: Cross-sectional study among the NutriNet-Santé cohort participants. BMJ Open. 2017 Jun 1;7(6).
42. Backholer K, Beauchamp A, Ball K, Turrell G, Martin J, Woods J, et al. A framework for evaluating the impact of obesity prevention strategies on socioeconomic inequalities in weight. Am J Public Health. 2014 Oct 1;104(10):e43–50.
43. Wardhani DA, Nissa C, Setyaningrum YI. Peningkatan Pengetahuan Remaja Putri Melalui Edukasi Gizi Menggunakan Media Whatsapp Group. J Gizi. 2021;10(1):31.
44. Ward V. Why, whose, what and how? A framework for knowledge mobilisers. Evid Policy. 2017;13(3):477–97.
45. Evripidou M, Charalambous A, Middleton N, Papastavrou E. Nurses' knowledge and attitudes about dementia care: Systematic literature review. Perspect Psychiatr Care. 2019;55(1):48–60.
46. Lewallen TC, Hunt H, Potts-Datema W, Zaza S, Giles W. The Whole School, Whole Community, Whole Child Model: A New Approach for Improving Educational Attainment and Healthy Development for Students. J Sch Health. 2015;85(11):729–39.
47. Poínhos R, Van Der Lans IA, Rankin A, Fischer ARH, Bunting B, Kuznesof S, et al. Psychological determinants of consumer acceptance of personalised nutrition in 9 European countries. PLoS One. 2014;9(10).
48. Buetow SA. Psychological preconditions for flourishing through ultrabilitation: a descriptive framework. Disabil Rehabil [Internet]. 2020;42(11):1503–10. Available from: https://doi.org/10.1080/09638288.2018.1550532
49. Jalambo MO, Sharif R, Naser IA, Karim NA. Improvement in Knowledge, Attitude and Practice of Iron Deficiency Anaemia among Iron-Deficient Female Adolescents after Nutritional Educational Intervention. Glob J Health Sci. 2017;9(7):15.
50. Bjerrum M, Tewes M, Pedersen P. Nurses' self-reported knowledge about and attitude to nutrition - before and after a training programme. Scand J Caring Sci. 2012;26(1):81–9.
51. Bay JL, Mora HA, Sloboda DM, Morton SM, Vickers MH, Gluckman PD. Adolescent understanding of DOHaD concepts: a school-based intervention to support knowledge translation and behaviour change. J Dev Orig Health Dis. 2012;3(6):469–82.