ORIGINAL ARTICLE

Changes of the Diet Quality for Coronary Heart Disease Patients in Bogor, West Java, Indonesia

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ABSTRACT

Introduction: Compliance of Alternate Healthy Eating Index (AHEI) 2010 relates to the reduction of mortality risks due to Coronary Heart Disease (CHD). In Indonesia, AHEI has not been widely used to evaluate diet quality especially for CHD. This study aims to analyse the diet quality changes for CHD. **Methods:** This study used the secondary data of Cohort Study of Non-Communicable Disease Risk Factors from the Indonesian Ministry of Health. The diet quality was assessed by using modified AHEI 2010 USA, adjusted to the Indonesian portion. Single 24-hour dietary was performed once prior to CHD and once after CHD. The CHD sufferers were assessed based on the result of ECG and 124 new cases. This study used the longitudinal repeated measures. **Results:** The total score for diet quality a year prior to CHD was 58.6 point and a year after CHD was 63.6 point. After the improvement, the diet quality score a year after CHD increased five points, 66.9% which shows score improvement (improved diet quality) and 33.1% which shows score deterioration (deteriorating diet quality). There are some differences and the significant improvement diet quality is at the total score, specifically fruits, nuts and sodium score ($P<0.05$). **Conclusion:** The CHD diet quality had improved up to five points, in which the points of fruits components were 2.8, nuts and sodium were one. Although, it was significantly improved, the intake had not achieved the recommendation.

Keywords: Indonesian Healthy Eating Index,Coronary Heart Disease

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INTRODUCTION

Non-communicable diseases represent 63% of all annual deaths and CHD contributes 85% (1). In Indonesia, CHD has been the most dominant cause of death in all ages after stroke, which is 12.9% (2). The prevalence of CHD in Indonesia increased in 2018 compared to 2013, from 0.5% to 1.5% (3,4). The prevalence of CHD in Bogor is higher than the national rate, that is 2.2% (4). CHD is related to food consumption which is a major problem in the prevention and reduction of complications due to CHD (5). Good food consumption is done by regular consumption of fruits and vegetables, whole grains and legumes, reducing consumption of sugar-sweetened beverages, sodium, low-fat foods and low-carbohydrate foods (6,7). Total fiber intake can reduce total cholesterol per seven grams per day by 9% (8). Omega 3 fatty acids, namely EPA, DPA and DHA, can reduce total cholesterol levels for EPA by 9%, DPA 10% and DHA 10% (9). Whole grains intake can reduce total cholesterol levels of 0.20 mmol/L and LDL levels of 0.19 mmol/L (10).

Diet quality provides information about good food consumption to avoid various complications due to from CHD. Diet quality in CHD is associated with a reduction in complications between 17 to 26% (11-13). Diet quality changes can be seen from the results of the diet quality before and after the disease diagnosis. After the diet quality changes, it increased to 8.3% for men and 7.9% for women (13,14). Healthy Eating Index (HEI) is an instrument that is developed from Dietary Guidelines for Americans to score the diet quality. The modification of HEI designed from the food type and nutrient related to CHD is AHEI 2010 (15). There have been many studies on risk factor of CHD in Indonesia. However, the studies on diet quality which was measured by AHEI 2010 for CHD are still limited. Most studies on diet in Indonesia mostly focus on the consumption of vegetables, fruits and fat (16,17). Therefore, this study aims to analyse the diet quality changes of CHD suferrers with modified AHEI instruments for adults (over 29 years old) by using Cohort Study of Non-Communicable Disease Risk Factors from the Indonesian Ministry of Health Bogor, West Java.

MATERIALS AND METHODS

Design and sample

This study is a cohort study based on community. In

this study, secondary data of cohort study in Bogor were analysed. This study concerning diet quality change in CHD sufferer used longitudinal and repeated measures study design to see the change of diet quality a year prior to CHD and a year after CHD. This cohort study had been conducted since 2011 in five selected villages in the Regency of Central Bogor, Bogor, West Java, Indonesia; they were Kebon Kalapa, Babakan Pasar, Babakan, Ciwaringin, dan Panaragan.The data analysed in this study were retrieved from 2012 to 2017.

Samples were CHD sufferers taken from the cohort study. Data inclusion criteria were CHD cases that appeared during 2013 to 2016 and there were no missing variables in the main dependent and independent variables, namely diet quality and CHD data. The exclusion criteria were incomplete data on the main dependent and independent variables, which were dietary quality variables, CHD data and participants taking drugs related to appetite.

The number of samples in this study was 124 new cases. The selection of new cases of CHD began with the participants, which were 5,000 respondents. Then, a systematic screening was carried out to obtain a sample of 146 participants. However, from the 146 participants, we continued the screening and found incomplete data of eight people and incomplete consumption data of 14 people. The total number of samples obtained was 124 new cases of CHD. This cohort data source has received an ethics approval updated annually from the Health Research Ethics Commission, Health Research and Development Agency.

Assesment of diet quality

Dietary quality thatwas assessed a year prior to CHD and a year after CHD used single 24-hour dietary recalls. The cohort study was performed by annual nutrition monitoring. In the first year, (2013 and 2014) 74 cases were taken for dietary recall prior to CHD diagnosis (2012 and 2013) and after getting diagnosed with CHD (2014 and 2015). In the following year, (2015 and 2016) 50 cases were taken for dietary recall before the sufferers were diagnosed with CHD (2014 and 2015) and after CHD diagnosis (2016-2017). Each participant was interviewed using a single 24-hour dietary recall questionnaire and was asked to recall all the food consumed the previous day. The tool in the form of food model was used to make standardized perceptions of types of food and the amount of food consumed. The food consumption data were collected by trained nutrition enumerators.

Measuring single 24-hour dietary recalls to calculate AHEI based on one or even two days intake might not function as a good predictor for CHD which took years to develop. However, assessing the quality of the diet based on habits or regular intake could serve as a better predictor. NHANES used a single 24-hour to assess food intake. This study sought to mimic the methods of a previous study. NHANES is currently considered the best source of valid and reliable data on food intake (18-20).

The quality of the diet was assessed by using AHEI 2010 developed from the Dietary Guidelines for Americans, but some portions had been modified based on recommendations for Indonesia. The modified AHEI 2010 consists of eleven food components. Five components (grains/staple food, vegetables, fruits, nuts and legumes, and sodium) had been adjusted based on Indonesian food portions according to the 2014 Balanced Nutrition Guidelines and the Indonesian Food Composition Table, omega 3 which was adjusted to Indonesia's nutritional adequacy rate and other components such as sugar-sweetened beverages, red/processed meat, trans fat, PUFA, and alcohol used the AHEI cut-off 2010 (21,22). The content of PUFA, trans fat, and omega 3 were obtained from Thaiand USDA food composition tables because these components have not been included in Indonesian food composition tables. Table I shows the components and scaling methods of the modified AHEI 2010. All components were scored from zero (unhealthy) to 10 (healthiest) and the total score ranged from zero (disobedient) to 110 (perfect compliance). Changes in the diet quality score were calculated based on the difference between the final score which was a year after CHD and the initial score which was a year prior to CHD.

Ascertainment of Incident CHD

We defined a new case of CHD when the examination result by cardiologists showed ECG abnormalities

Table I. Alternate Healthy Eating index (AHEI) 2010 Modification

Component	Minimum criteria score (0)	Maximum criteria score (10)
Vegetables[1], servings/day	0	≥ 3-4
Fruit[2], servings/day	0	≥ 5
Grains/staple food[3], g/day	0	≥ 100
Sugar-sweetened beverages[4], servings/day	≥ 1	0
Nuts and legumes[5], servings/day	0	≥ 3
Red/processed meat[6], servings/day	≥ 1.5	0
Trans fat, % of energy	≥ 4%	≤ 0.5%
Long-chain (n-3) fats (EPA +DHA), mg/day	0	≥ 110
PUFA[7], % of energy	≤ 2%	≥ 10%
Sodium, mg/day	> 2.000	≤ 2000
Alcohol for female[8],drinks/day	≥ 2.5	0.5 – 1.5
Alcohol for male[8], drinks/day	≥ 3.5	0.5 – 2.0
Total AHEI score	0	110

[1] One serving is 0.5 cup of vegetables or 1 cup of green leafy vegetables.
[2] One serving is 1 medium piece of fruit or 0.5 cup of berries.
[3] One serving is 0.75 cup of oatmeal or rice.
[4] One serving is 8 oz.
[5] One serving is 1 oz of nuts or 1 tablespoon (15 mL) of peanut butter.
[6] One serving is 4 oz of unprocessed meat or 1.5 oz of processed meat.
[7] PUFAs=polyunsaturated fatty acids.
[8] One drink is 4 oz of wine, 12 oz of beer, or 1.5 oz of liquor.

according to the report of the Cohort Study. CHD data were collected from 2013 to 2016, where 74 new cases of CHD appeared in the first two years (2013 and 2014) and 50 cases in the next two years (2015 and 2016). The total new CHD cases were 124.

Measurement of Characteristics of the Participants

Information about age, sex, education level, family income, physical activity, and smoking status was collected using a structured questionnaire given to participants conducted by the Cohort Study. Physical activity data were collected using an International Physical Activity Questionnaire (IPAQ) questionnaire developed by WHO that was adopted by the Indonesia Ministry of Health for national surveys. Body Mass Index (BMI) is calculated as weight (in kilograms) divided by height (in meters) squared. Blood pressure is measured through standard protocols, in which the second and the third measures are averaged. Hypertension is defined as systolic blood pressure ≥140 mmHg, diastolic blood pressure ≥90 mmHg or the consumption of blood pressure medication in the past two weeks. Diabetes is defined as fasting blood sugar level ≥126 mg/dL or blood sugar level two hours after loading glucose 75 g, which is ≥200 mg/dL or consuming diabetes drugs in the last two weeks. LDL, HDL and triglyceride cholesterol levels are defined as normal LDL levels <100 mg/dL. Normal HDL levels are>40 mg/dL for men and>50 mg/dL for women. Normal triglyceride levels are <150 mg/dL (23). The information was taken when the participants were first diagnosed with CHD.

Statistical analysis

Descriptive analysis was performed for all variables. Comparisons of diet quality scores were performed using the Paired t test and Wilcoxon test. Statistical significance was defined by p<0.05. All data were analysed using SPSS VERSION 23.

RESULTS

Characteristics of the participants

In the cohort study, the participants' characteristics were taken when CHD was first diagnosed. The characteristics of the participants are shown in Table II. The majority of people with CHD are 46 to 55 years old 40.3%, female 73.4%, moderate level of education 43.5%, adequate level of family income 58.9%. People with CHD who perform enough physical activity are 60.5% and those who do not smoke are 48.4%. Comorbid or other health problems people with CHD suffer from are hypertension 58.1%, obesity 58.1%, high levels of LDL cholesterol 83.9% and low levels of HDL cholesterol 60.5%.

Change in diet quality

There was a significant improvement in diet quality over the two-year monitoring period, the average score of modified AHEI diet quality a year prior to CHD: 58.6 (SD 10.6), in which 50.8% are included in the upper category and 49.2% are in the lower category. The average score of modified AHEI diet quality a year after CHD: 63.6 (SD 8.9), in which 48.8% are included in the upper category and 51.6% are in the lower category (both have p<0.05). The total score of diet quality improved during a year after CHD by five points, 66.9% had improved scores (improved diet quality) and 33.1% had decreased scores (deteriorating diet quality). Dietary component scores that increased significantly over time were fruits, nuts/seeds and sodium components (p<0.05) (Table III). Participants with a large increase in the modified AHEI score increased their fruit intake significantly by 0.7 servings per day (Table IV).

Table II. Characteristics of Participants

	Participants (n = 124)	Percentage
Age, No. (%)		
29-35 years	5	4.0%
36-45 years	28	22.6%
46-55 years	50	40.3%
56-64 years	41	33.1%
Gender, No.(%)		
Male	33	26.6%
Female	91	73.4%
Education level, No. (%)		
low education level	54	43.5%
moderate education level	54	43.5%
high education level	16	12.9%
Level of family income, No. (%)		
poor (< Rp 3,557,146)	51	41.1%
adequate (≥Rp 3,557,146)	73	58.9%
Physical activity level, No. (%)		
low (<600 MET)	49	39.5%
enough (≥600 MET)	75	60.5%
Smoking status, No. (%)		
current smoker	47	37.9%
former smoker	17	13.7%
never smoker	60	48.4%
Hypertension, No. (%)		
yes	72	58.1%
No	52	41.9%
Diabetes Mellitus, No (%)		
yes	24	19.4%
No	100	80.6%
Obesity, No. (%)		
yes (BMI ≥ 25 kg/m^2)	82	66.1%
No	42	33.9%
Cholesterol LDL level, No. (%)		
high(≥100 mg/dL)	104	83.9%
low (<100 mg/dL)	20	16.1%
Cholesterol HDL level, No. (%)		
low	75	60.5%
high (male >40 mg/dL; female >50 mg/dL)	49	39.5%
Cholesterol trigliceryde level, No. (%)		
high (≥150 mg/dL)	41	33.1%
low (<150 mg/dL)	83	66.9%
Stroke, No. (%)		
yes	4	3.2%
no	120	96.8%

Table III. Modified AHEI-2010 Scores and Changes from Before CHD to After CHD

Component	Score, mean (SD)		Absolute change mean (SD)[1]	P-value[2]
	a year before CHD	a year after CHD		
Total	58.6 (10.6)	63.6 (8.9)	5.0 (12.9)	<0.05
Vegetables	3.1 (2.7)	3.6 (2.4)	0.5 (2.9)	0.065
Fruit	2.6 (3.9)	5.4 (4.1)	2.8 (5.7)	<0.05
Grains/staple food	10.0 (0.0)	9.9 (0.2)	-0.1 (1.2)	0.317
Sugar-sweetened beverages & fruit juice	4.2 (4.9)	4.5 (4.9)	0.3 (5.8)	0.710
Nuts and legumes	4.9 (4.1)	5.9 (3.5)	1.0 (5.2)	<0.05
Red/processed meat	8.5 (3.2)	7.9 (3.8)	-0.6 (4.6)	0.140
Trans fat, % of energy	3.2 (0.9)	3.1 (1.4)	-0.1 (1.8)	0.776
Long-chain (n-3) fats (EPA +DHA)	0.3 (0.6)	0.2 (0.6)	-0.1 (0.7)	0.731
PUFA, % of energy	3.4 (1.8)	3.7 (1.7)	0.3 (2.3)	0.060
Sodium	8.4 (3.7)	9.4 (2.3)	1.0 (3.9)	<0.05
Alcohol	10.0 (0.0)	10.0 (0.0)	0.0 (0.0)	1.000

[1] Absolute change was calculated from: (AHEI score a year after CHD – AHEI score a year before CHD).
[2] Paired t test and Wilcoxon test, p-value significant if <0.05.

Table IV: Servings of Actual Consumption and Changes from Before CHD to After CHD

Component	Servings in maximum score	Actual consumption, mean (SD)		Absolute change mean (SD)[9]	P-value[10]
		a year before CHD	a year after CHD		
Vegetables[1], servings/day	≥3-4	1.0 (1.2)	1.1 (0.7)	0.1 (1.2)	0.156
Fruit[2], servings/day	≥5	0.8 (1.8)	1.5 (1.6)	0.7 (2.4)	<0.05
Grains/staple food[3], g/day	≥100	242.9 (88.0)	243.7 (95.4)	0.7 (106.3)	0.880
Sugar-sweetened beverages[4], servings/day	0	1.1 (1.2)	0.9 (1.1)	-0.1 (1.3)	0.320
Nuts and legumes[5], servings/day	≥3	1.2 (1.2)	1.4 (1.2)	0.2 (1.6)	0.152
Red/processed meat[6], servings/day	0	0.3 (0.9)	0.6 (2.3)	0.3 (2.4)	0.189
trans fat, % of energy	≤0.5%	2.6 (1.1)	2.6 (1.1)	0.0 (1.6)	0.827
Long-chain (n-3) fats (EPA +DHA) mg/day	≥110	3.3 (6.9)	2.6 (6.5)	-0.7 (8.5)	0.727
PUFA[7], % of energy	≥10%	3.6 (1.6)	3.9 (1.6)	0.3 (2.1)	0.087
Sodium, mg/day	≤2000	1416.3 (714.6)	1256.9 (577.3)	-159.4 (748.5)	0.059
Alcohol[8], drinks/day	≤0.5	0.0 (0.0)	0.0 (0.0)	-	-

[1] One serving is 0.5 cup of vegetables or 1 cup of green leafy vegetables.
[2] One serving is 1 medium piece of fruit or 0.5 cup of berries.
[3] One serving is 0.75 cup of oatmeal or rice.
[4] One serving is 8 oz.
[5] One serving is 1 oz of nuts or 1 tablespoon (15 mL) of peanut butter.
[6] One serving is 4 oz of unprocessed meat or 1.5 oz of processed meat.
[7] PUFAs=polyunsaturated fatty acids.
[8] One drink is 4 oz of wine, 12 oz of beer, or 1.5 oz of liquor.
[9] Absolute change was calculated from: (Actual consumption a year after CHD – Actual consumption a year before CHD).
[10] Wilcoxon test, p-value significant if <0.05.

DISCUSSION

Most of the participants in this study were 46 to 55 years old 40.3% and female 73.4%. It was lower than the results of other study, since most of the CHD participants who were 46 to 55 years old were 66.5% (24). The prevalence of CHD will increase with age. The prevalence of CHD in women is higher than in men. The results of the study are in line with the results of a national end line survey (3,4).

Most of the participants were poorly or moderately educated; those who were graduated from junior high to senior high school are up to 43.5%. It was higher compared to the results of the previous study in which the poorly educated participants were 29.7% and moderately educated were 25.7% (16). However, it was lower compared to the results of the other previous study, in which the majority of the moderately educated participants were 66% (24). People with CHD are sometimes found poorly educated; the low education will give fewer benefits to health problems, because education is related to understanding health information (25). More than half of the participants had enough family income which was more than the average minimum wage of Bogor ≥ Rp 3,557,146 by 58.9%. It was greater than the results of a previous study, where the majority of CHD participants had a sufficient family income of 24.3% (16). Participants who have good incomes will have an easier access to food both in quality and quantity (25).

Most of the participants did sufficient physical activities at 60.5% and almost a half of the participants did not smoke 48.4%. It was lower compared to the results of previous studies which stated that the majority of CHD participants performed sufficient physical activities by 77.4% and most CHD participants did not smoke by 62% (16). Physical activities can improve the body's physiological functions and good coronary circulation if they are done with sufficient frequency and performed daily. The CHD participants did not smoke because they suffered from CHD so that it had stopped them from smoking. Physical activities and smoking can improve one's food consumption, thereby reducing the risk of complications due to coronary heart disease (26).

CHD participants mostly had comorbid or other health problems such as hypertension by 58.1%, obesity by 58.1%, and lipid profile disorders,such as LDL levels by 83.9%, low level of HDL by 60.5%. It was higher compared to the results of a previous study, in which the CHD participants who suffered from hypertension are 33.7%, obesity 24.3%, high levels of LDL by 21.5%, low level of HDL by 20.3% (27). It was also higher compared to low HDL in Indonesia 34.8% and high triglycerides in Indonesia 15.1% (28).

The results showed that most CHDs had obesity, high LDL, low triglycerides, low HDL, and high blood pressure. This condition usually occurred in CHD sufferers, because obesity, high LDL, high triglycerides, and low HDL are risk factors for people with CHD. The Body Mass Index disorder or obesity, cholesterol and hypertension are normal in someone's aging process. Thus, CHD is often found in elderly since the aging process occurs in old age (29,30).

The average of modified AHEI diet quality score a year prior to CHD: 58.6 (SD 10.6); 50.8% of them were in the

above category and 49.2% were below. The average of modified AHEI diet quality score a year after CHD: 63.6 (SD 8.9), 48.8% of them were in the above category and 51.6% were below (both had $p<0.05$). Total diet quality scores improved during a year after CHD by five points, 66.9% had improved scores (improved diet quality) and 33.1% had decreased scores (deteriorating quality of diet). A previous study stated that the trend in diet quality showed that the average result of the AHEI score increased significantly from 39.9 points to 46.8 points ($p<0.001$) (26).

Changes in total diet quality scores can occur due to the reduced intake of sugar-sweetened beverages and increased intake of vegetables, fruits, and nuts because they can contribute more to diet quality scores improvement (13,14,18,31-33). The study conducted showed that a year before CHD 1.1 servings per day and a year after CHD 0.9 servings per day. However, the intake of increase a year before CHD 1.0 servings per day and a year after CHD 1.1 servings per day, then for fruits a year before CHD 0.8 servings per day and a year after CHD 1.5 servings per day and for nuts a year before CHD 1.2 servings per day and a year after CHD 1.4 servings per day (Table IV). The average sugar-sweetened beverages score almost reached the maximum value. It is because the population in Bogor consumed sugar-sweetened beverages in normal portion (34).

Most of food aspects in this study showed improved diet quality score (improved diet quality) a year after CHD compared to a year prior to CHD, although the improvement of diet quality score for each food was different as some showed significant improvement but not for the others. The component scores of diet quality that significantly improved are fruits, nuts/seeds and sodium ($p<0.05$) (Table III). The fruits component showed changes at 2.8 points, the nuts component at 1.0 points and the sodium component at 1.0 points. In line with the results of previous studies, there was an increase in diet quality score in the fruits and nuts components. Component score increased by 0.7 points for fruits and 0.4 points for nuts ($p<0.001$) (33). Fruits are effective in reducing high blood pressure and blood lipids. Increasing consumption of carotenoid-rich fruits maintains cholesterol levels in blood for they can reduce oxidative damage and cause an increase in LDL oxidation resistance (35). The higher consumption of nuts, the lower the death risk of heart disease, so the increase in consumption of nuts or seeds is good for reducing complications in CHD (36). The increase of sodium score can help reduce systolic blood pressure by 3.39 mmHg and diastolic blood pressure by one point fifty four mmHg; hence, it reduces the possibility of complications from CHD (37).

The results of monitoring the diet quality were seen after the sufferers had been diagnosed with the disease (18). After being diagnosed with the disease, most of the participants preferred to eat healthy food (38). That was because the participants who had been affected by the disease usually knew the good or bad effects of food on an illness they suffer from (18,32). The results showed that participants at the time after suffering from CHD had a change in diet quality that was on the total diet quality score, and specifically there was an increase in the diet quality score on the components of fruits, nuts or seeds, and sodium.

The majority of average food consumption in this study increased during the year after CHD compared to the year prior to CHD, although a significant increase was only found in fruit consumption by 0.7 servings/day (Table IV). Fruit consumption among the participants had not reached the number of portions recommended by the adult age group (over 29 years old) based on the 2014 Indonesian Balanced Nutrition Guidelines, which wasat least five servings/day. However, the average fruit consumption in this study, which was in Bogor, was higher than the average fruit consumption in other studies in Bogor Regency, which was only 0.5 portions (34). Fruits contain high fiber, vitamins, minerals, phytochemicals and antioxidants (39). Increased consumption of fruits could contribute to the participants' increased diet quality score. The results of previous studies stated that a significant increase in fruit consumption could contribute to increasing diet quality scores in participants (13,14,31).

The low consumption of fruit was allegedly because of the availability of fruit variations that made the participants reluctant to consume fruits. This was indicated by the single 24-hour dietary recall of the fruit consumption, in which only bananas and papayas were mostly consumed. Previous research also mentioned that the fruit consumption rate of Indonesian people was still low; it was only 57.1 grams per person per day, not meeting the standard portion recommended by the Balanced Nutrition Guidelines (21). The diversity of fruits found around the community was not able to increase fruit consumption in the community, because the fruit mostly consumed was only bananas which was 15.1% (40). Then, the results of previous studies also indicated that many Indonesian people did not consume fruit and 93.5% of the population above 10 years old consumed fruit under the recommendation (4). Fruits are effective in reducing high blood pressure and blood lipids so as to reduce complications or death due to CHD. Increased consumption of carotenoid-rich fruits maintains blood cholesterol levels because it can reduce oxidative damage and increase LDL oxidation resistance (13,35).

The average consumption of food components other than fruits mostly increased, but not significantly (Table IV). This was in line with the results of previous studies indicting that the average consumption of food such as PUFA, omega 3, and beans increased but the amount

was very small. This aligns with the results of previous studies which stated that mostly there were no increase in omega 3 components, legumes and PUFA (33,41). Based on the results of a single 24-hour dietary recall in this study, it turned out that most of them consumed less food containing omega 3 and PUFA such as sea fish and nuts. They did not avoid eating foods that are fried or burned.

Each participant diagnosed with CHD was advised to come to the Community Health Centre for consultation on medication and nutritional counselling. However, research results in a cohort study stated that only 18.2% of CHD sufferers visited the Community Health Centre and based on their routine medical treatment, it turned out that most CHD sufferers did not routinely seek treatment (57.1%) (42). According to the previous studies of CHD, sufferers who regularly visited the Health Centre or clinic for treatment or counselling could determine healthier food choices, and healthier life behaviours because through counselling, CHD sufferers would be given guidance and recommendations for appropriate nutritional intake and encouraged to adopt a healthy lifestyle. So, it is more likely that the sufferers would have improved diet quality (43,44).

The strengths of our study are based on the longitudinal design with repeated measures, using secondary data from the Cohort Study so that the study focused more on changing the diet quality of CHD sufferers and apprehended how the quality of the diet was in a year prior to CHD and a year after CHD. In addition, dietary data and participant characteristics data were taken by health workers and trained enumerators so that measurement and data collection errors could be avoided. Another methodological consideration was that only one with drawal was collected from each participant. In addition, the participants were in Bogor, West Java. Thus, the results of this study must be generalized only for the same population. However, the similarity between this study and the level of intake reported from national data shows that our results can also be generalized to the Indonesian population.

CONCLUSION

More than half of CHD sufferers were around 46-55 years, women, had low education, and had enough family income. Nearly one third of CHD sufferers had sufficient physical activities and did not smoke. Most people with CHD had comorbidities or other health conditions such as hypertension, obesity, LDL cholesterol levels and abnormal HDL. The total score of CHD diet quality improvement is five points, in which the fruit component were 2.8 points, and nuts and sodium was one point. Despite the significant increase, the intake of each component had not met the recommendations. So, additional public health strategies are needed to promote the recommended food intake for CHD sufferers.

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