

THE INFLUENCE OF EATING HABITS OF MINAHASAN DISHES ON THE OCCURENCE OF CORONARY HEART DISEASE

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Abstrak: Penyakit jantung koroner (PJK) merupakan masalah kesehatan jantung baik di dunia maupun di Indonesia termasuk Propinsi Sulawesi Utara, dan menempati urutan pertama sebagai penyebab kematian. Penyebab terjadinya PJK multifaktorial; salah satunya adalah kebiasaan makan yang dipengaruhi oleh faktor budaya, adat istiadat, agama dan kepercayaan. Penelitian ini dilakukan untuk mengetahui pengaruh kebiasaan makan makanan etnik Minahasa terhadap kejadian PJK. Metode *case control* dengan 128 kasus dan 128 kontrol yang diambil dari RSU Prof. Dr. R.D. Kandou. Dilakukan pengumpulan data frekuensi makan dengan menggunakan *Food Frequency Quationnaire* (FFQ) untuk melihat hubungan kebiasaan makan dengan PJK. Umumnya makanan etnik Minahasa mengandung asam lemak jenuh 0,01-10,46 % per 100 gramnya. Seseorang yang mengomsumsi jenis makanan berisiko PJK seperti babi putar dengan frekuensi makan ≥ 2 kali/bulan mempunyai kemungkinan terkena PJK 4,43 kali lebih besar dibanding dengan yang mengonsumsi ≤ 1 kali/bulan, setelah dikontrol oleh babi hutan (OR=4,3 95% CI:1,66-11,05), kotey/sa'ut (OR=7,15 95%CI: 1,70-30,08), merokok (OR=2,76 95% CI: 1,36-5,61), usia (OR=1,96 95%CI: 1,36-2,83), jenis kelamin (OR=2,86 95%CI: 1,41-5,78), dan hipertensi (OR=5,86 95%CI: 2,94-11,66). Berdasarkan 41 jenis makanan yang dikomposit, seseorang yang mempunyai kebiasaan makan makanan etnik Minahasa dengan frekuensi sering (total skor \geq nilai *mean*) mempunyai kemungkinan 5,4 kali lebih besar untuk terkena PJK dibanding dengan yang mempunyai kebiasaan makan jarang (total skor \leq nilai *mean*), setelah dikontrol oleh faktor jenis kelamin, riwayat PJK dalam keluarga, dan diabetes.

Kata kunci: kebiasaan makan, makanan Minahasa, asam lemak jenuh, penyakit jantung koroner.

Abstract: Coronary Heart Disease (CHD) is the leading cause of disability and mortality in Indonesia and North Sulawesi as well as the rest of the world. There are many factors that contribute to the development of CHD. Eating habits are believed to be risk factors and are influenced by culture and religion. This research explores the influence of eating habits of the Minahasans, particularly of the dishes that contain high level of fats contributing to the development of CHD. The methodology of this research involved case controls. The respondents were taken from Prof. Dr. R.D. Kandou General Hospital in Manado, North Sulawesi. The samples were divided into two groups consisting of 128 cases of CHD and 128 cases without CHD for control. Eating frequencies were obtained through Food Frequency Questionnaires (FFQ). The purpose of using these analyses was to obtain the actual effects of the eating habits involving a variety of Minahasan dishes which were believed to have had some contribution to the risks of CHD. Those who ate whole roasted pigs more than twice a month were 4.43 times more susceptible to develop CHD compared to those who ate whole roasted pigs less than once a month, after being controlled by the eating of wild boar (OR=4.3 95% CI: 1.66-11.05), banana heart and stem (OR=7.15 95% CI: 1.70-30.08), smoking (OR=2.76 95% CI: 1.36-5.61), age (OR=1.96 95% CI: 1.36-2.83), gender (OR=2.86 95% CI: 1.41-5.78), and hypertension (OR=5.86 95% CI: 2.94-11.66). Based on the consumption of

41 kinds of Minahasan dishes, those who frequently ate these on a daily bases had a 5.4 higher probability of developing CHD with an eating habit score of \geq mean value, compared to those who ate less frequently with an eating habit score of \leq mean value, after being controlled by gender, family history of CHD, and diabetes mellitus.

Keywords: eating habit, Minahasan foods, saturated fatty acid, coronary heart disease.

Cardiovascular disease is still a hot topic in public health issues. It killed over 180,000 people in the United Kingdom and 500,000 people in the United States every year.¹⁻³ Coronary Heart Disease (CHD) is an increasing cause of death in Indonesia with an increase from 11th (*Survei Kesehatan Rumah Tangga/SKRT* 1972) to 3rd (SKRT 1986) and becoming the main cause of deaths (SKRT 1992, 1995, and SKRT 2001, SKRT 2005).⁴ Moreover, North Sulawesi, as one of the thirty provinces in Indonesia, has the highest number of deaths caused by cardiovascular diseases.^{5,6} According to reports from Prof. Dr. R.D. Kandou General Hospital in Manado, the main reference hospital in North Sulawesi Province, cardiovascular disease was the main cause of deaths.⁷

CHD is a degenerative disease that is affected by atherosclerosis manifested in coronary arteries, and other risk factors. There are risk factors that can be controlled or modified, such as hypertension, dyslipidemia, smoking, diabetes mellitus, obesity, stress, and physical inactivity. Besides that, there are also risk factors that can not be modified such as: age, genetics, gender, and race.^{8,9} CHD risk was 2.5 times higher in people with family histories of CHD or sudden deaths before age 50 compared to people without these histories.¹⁰⁻¹² Hypertension is closely related to CHD, because hypertension increases the risk of CHD six times higher than normotension.¹³ Several studies showed that diabetes mellitus patients have greater risks (two to three times) to develop CHD compared to normal people. North Sulawesi has the highest prevalence of diabetes mellitus in Indonesia.⁵

Based on the national census year 2003, about 26% of Indonesians consumed vegetables less than seven times a week.

Around 86% Indonesians (age ≥ 10) consumed fruit less than seven times a week; only 2% consumed fruit ≥ 14 times a week.¹⁴

Hatma's research (2001) on four ethnic groups (Minangkabau, Javanese, Sundanese, and Bugis) in Indonesia found that saturated fatty acid was 21% of total energy consumption.¹⁵ Meanwhile, the American Heart Association (AHA) advised that saturated fatty acid consumption should be $< 10\%$ of total energy intake. It means that the saturated fatty acid consumption of Indonesians was high.^{10,15-18}

Eating habits are influenced by socio-cultural factors, customs, religions, and beliefs, and these habits identify how individuals or communities satisfy their nourishment needs.⁶

Indonesia has over 500 ethnic groups with various life styles; one of them is the Minahasans with a majority living in the North Sulawesi province where they comprise the largest ethnic group.^{19,20}

The Minahasans usually celebrate parties with banquets, mostly consisting of Minahasan dishes derived from animal fat (mostly pork). The Minahasans eat pork as frequently as other Indonesian people eat beef.²⁰

The objective of this research was to find out the influences of Minahasan consumption of dishes enriched by saturated fatty acids on CHD, including observations such as sedentary life style, smoking, alcohol consumption, as well as age, sex, family history, and associated diseases (hypertension, obesity, and diabetes mellitus).

METHODS

This research was carried out in the Prof. Dr. R.D. Kandou General Hospital,

and was designed for non-randomized case control. Studies were made of new inpatients and outpatients, based on the hospital medical records. All of them had electrocardiography (ECG) examinations and were diagnosed by cardiologists as first time CHD patients (according to AHA guidelines/PERKI guidelines 2004). As control group, we took inpatients and outpatients with no CHD history, but who had had ECG examinations, and had been diagnosed by cardiologists as non CHD patients.²¹

This research was preceded by a survey. Its objective was to find out the eating habits of the Minahasans living in North Sulawesi, especially those who consumed certain dishes that were high in saturated fatty acids. Observations were made of those dishes that were usual eaten by the Minahasans, daily or occasionally, e.g. in parties.

Furthermore, samples of food from party dishes and daily dishes were analyzed for their saturated fatty acid contents. The result was a new finding that could be included in the list of foods in Indonesia. Saturated fatty acid examinations of 41 dishes usually consumed by Minahasans were performed with gas chromatography by the Food & Nutrient Laboratory in the Nutrient Research & Development Center of the Health Department of the Republic of Indonesia in Bogor.

The research population was all the patients that came to Prof Dr R.D.Kandou General Hospital. Research samples were patients treated in the Cardiology Department of the hospital (based on inclusion and exclusion criteria). The control group patients were those not diagnosed as CHD patients and were treated in other sections. Before carrying out this research, all clearances were received from the Ethical Clearance Team of the Public Health Faculty, University of Indonesia, and from the Medical Committee of Prof.Dr RD Kandou General Hospital.

Sample size was calculated based on minimum sample formulation of 1:1 non-randomized case and control; the result was

n=128 cases and n=128 controls with a total sample number 256. Dietary assessment was held through *Food Frequency Questionnaires* (FFQ) concerning daily, weekly, monthly, and yearly eating habits. Data was processed by using the SPSS version 11(licensed), STATA 8 (licensed), and Windows Vista Basic Premium Microsoft Excel program.

Eating habit data received from FFQ were categorized in three columns of frequency: never, seldom, and often. The Receiver Operation Curve (ROC) analysis was executed to determine the cut off point for eating frequencies. The eating frequencies of subjects were obtained for all 41 kinds of Minahasan dishes. Univariate analysis for each research variable and bivariate analysis revealed 25 dishes that were related to the occurrence of CHD. For logistic regression we used five dishes that had the highest OR values, followed by a validiting interaction test for confounding variables. The results showed the effect of the kinds of high-risk dishes on the occurrence of CHD after controlling certain other factors (sedentary habits, smoking, alcohol consumption, age, sex, family history, hypertension, obesity, and diabetes mellitus). Then we analyzed combinations of several high-risk dishes.

The observations of eating habits were based on eating frequency considering the saturated fatty acids in the 41 dishes. Data was obtained from eating habits graded as 'seldom' and 'frequent' based on the cut-off point of the mean value because there was a normal distribution of data through the Kolmogorov-Smirnov test. Then bivariate analysis was held to see the relationship between each variable with the occurrence of CHD. Subsequently a multivariate analysis of logistic regression was carried out through the arrangement of the interaction analysis and confounding variables. Then we obtained the actual effects on the occurrence of CHD due to eating habits from frequently consumed dishes containing saturated fatty acids, compared with dishes of this type not regularly eaten.

RESULT

Case characteristics and controls

Daily physical activity (in this research: sedentary life style) of the respondents was categorized by: lack of movement or adequate movement. We found that almost all of the case group (86.75%) showed a lack of movement in their daily activities, while in the control group was 43.75%

Smoking habits were seen in 55.47% of the case group, while in the control group it was only 22.66%.

Alcohol consumption was identified in one-third (32.81%) of the case group. There were several kinds of alcohol drinks: *cap tikus* (Minahasan drink made from distillation of palm sugar), beer, and various kinds of local wines.

Individual characteristics: 40.63% of the subjects in the case group were 55-64 years old, while in the control group was 37.5%; 40.63% of the subjects in the case group were ≥ 65 years old, while the figure was 24.22% in the control group. Thus, most of the subjects of the case group were older than those in the control group.

We found 61.72% were males in the case group, while only 28.91% in the control group were males.

Almost half (41.44%) of the case group had CHD family histories, while that was true of only 24.22% in the control group.

Two-thirds (67.19%) of the case group had medical records indicating hypertension as opposed to the control group with only 35.94%.

Obesity or overweight was found in 62.5% of the case group, while only 37.5% in the control group.

Diabetes mellitus was found in 75% of the case group, in contrast to the control group which recorded 47.66% of families with histories of diabetes.

Descriptions about saturated fatty acids in Minahasan dishes

The saturated fatty acid contents in 41 Minahasan dishes were around 0.01-10.46% per 100 grams. One of the dishes,

tina'i (pork innards), had the highest fat content, as much as 10.46% per 100 grams of this dish. Dishes such as *tinutuan* (Manado vegetable porridge) had the lowest fat content, 0.01% per 100 grams.

Minahasan dishes that had high concentrations of saturated fatty acids (3.93-10.46% per 100 grams) were *tina'i*, *ayam santan* (chicken cooked with coconut milk), *babi tore* (crispy pork), roasted pork, *supbrenebon babi* (pork soup mixed with kidney beans), *babi putar* (whole roasted pig), *babi garo rica* (pork mixed with chilies), *tinorangsak* (pork and blood cooked in bamboo), *pangi babi* (pork mixed with pangli leaves), *paniki* (bat), *babi asam manis* (sweet and sour pork), soya bean pork, *RW* (dog meat), *babi hutan* (wild boar), *babi leylem* (pork mixed with leylem leaves) and *sup kuah asam babi* (pork soup). On the other hand, dishes with low saturated fatty acids (0.01-3.92% per 100 grams) are *tinutuan*, *sayur pait* (papaya leaves), *kotey/sa'ut babi* (banana flowers and trunks mixed with pork), *ikan cakalang goreng* (fried tuna fish), *ikan laut wokublanga* (fish cooked with various spices), *ikan mujair bakar* (roasted fresh water fish), *ikan mujair goreng* (fried fresh water fish), *ikan cakalang fufu saus* (smoked tuna fish), *ikan mas bakar rica* (roasted goldfish mixed with chili), *ikan mas wokublanga* (goldfish cooked with special spices), fried goldfish, *kangkung tumis* (sauteed water spinach), *tikus* (forest opossum), and *sayur rica rodo* (green bean mixed with corn and egg plant).

Almost all the dishes were made with pork. Minahasan dishes are usually quite spicy because they use a lot of chili (*Capsicum fretescens/cayenne*). Chili has a positive impact on the heart due to its important effects: anti-oxidant, anticoagulant, and antifibrinolytic. But the uniqueness of Minahasan dishes is that they consist of a variety of animal meats that are not usually found in other ethnic groups, such as bats, dogs, and forest opossum; as well as vegetables from banana trunks and flowers. Dishes made with opossum are also eaten in Zimbabwe.²²⁻²⁴

Besides saturated fatty acids, Minahasan dishes usually contain ginger and garlic. It is already known that ginger, especially red ginger (*Zingiber officinale var rubrum*) acts as an antioxidant that helps to neutralize the destructive effects of free radicals in the human body. Ginger stimulates the releasing of adrenalin and enlarges veins so that blood can more easily flow and help the work of heart in pumping blood. Gingerol in ginger is an anticoagulant that prevents blood agglutination, thus preventing the stepped up of vein as the main cause of heart attacks and strokes.^{25,26} The merit of garlic is that it decreases and stabilizes blood pressure, helps in decreasing the concentration of blood cholesterol, helps prevent blood coagulation, is a detoxifier and an antioxidant, and also has anti-bacterial effects.²⁷

The relationship of Minahasan foods to incidences of CHD

From 41 Minahasan dishes analyzed, 25 dishes are related to the occurrence of CHD, meanwhile 16 other dishes had opposite effects. The OR values were around 12.21-2.02. Dishes such as kotey/sa'ut babi had the highest OR values, that is 12.21 (95% CI: 3.61-41.24). Furthermore, the 25 Minahasan dishes that potentially influenced the occurrence of CHD were: tinorangsak, babi putar, babi hutan, babi leylem, babi garo rica, babi kecap, babi asam manis, roasted pork, babi tore, posana (liver, fat, and pork), kotey/sa'ut babi, sate babi, loba, tina'i, sayur pait babi, sup brenebon babi, sup babi kuah asam, sayur kangkung tumis babi, RW, paniki, tikus, ikan mas wok-ublanga, fried goldfish, ikan mas bakar rica, and ayam santan (Table 1).

The five dishes according the previous bivariante analysis that had the highest odd ratios were: sa'ut babi/kotey, paniki, loba, babi hutan, and babi putar. On the other hand, after carrying out a multivariate analysis of these five dishes, there remained three (babi putar, babi hutan and kotey/sa'ut babi) requiring further analyses. Through logistic regression, with other

controlling factors, the end model showed the highest-risk dishes for CHD (Table 2).

People who consumed babi putar more than twice per month had a higher probability (4.43 times, 95% CI: 1.55-12.65) of suffering from CHD compared to those who consumed the same dish less than once per month, in conjunction with other factors such as babi hutan, kotey/sa'ut, smoking, age, sex, and hypertension.

We analyzed high-risk dishes such as *babi putar* in combination with several other dishes that contain *rica* (bird's eye chillis), often consumed by Minahasans, and dishes that are rich in fibers such as papaya leaves. The result showed that the risk of CHD from eating *babi putar* combined with the dishes mentioned above has declined compared with that of *babi putar* alone. For example, the combination of *babi putar* with *ikan mas bakar rica* and/or *babi garo rica* in the multivariate analysis showed a decline in the OR value.

People that consumed *babi putar* combined with *ikan mas bakar rica* had a 3.47 times higher probability (OR=3.47 95% CI: 1.98-6.08) in getting CHD if the eating frequency $\geq 2x/month$ compared to those who consumed the same dishes $\leq 1x/month$, in addition to being controlled by certain factors such as sex, hypertension, obesity, and diabetes mellitus.

People that consumed *babi putar* combined with *babi garo rica* had a 2.87 times higher risk (OR=2.87 95% CI: 1.77-4.67) of getting CHD if the eating frequency $> 1-2x/month$, compared to those who consumed the same dishes $< 1x/month$, with controlling factors such as age, hypertension, obesity, and diabetes mellitus. We assumed that these OR alterations were due to the positive effects (antioxidant, anti-coagulant, and antifibrinolytic) of *rica* on the heart.

The combination of *babi putar* with *sayur pait* also showed a decrease of OR. People who consume *babi putar* with *sayur pait* $\geq 2x/month$ have a 3.25 times higher probability of getting CHD compared to those who consume the same dishes $\leq 1x/month$, in addition to being controlled by age and hypertension.

Table 1. The relationship between 25 potential dishes in the occurrence of CHD

No	Variable	Case		Control		Value p	OR	[95% Conf. Interval]		
		N	%	n	%					
1	Sa'ut babi/kotey									
	Frequency \geq 2x/month	29	23	3	2	0.00	12.21	3.61	-	41.24
	Frequency \leq 1x/month	99	77	125	98		Ref			
2	Paniki									
	Frequency \geq 2x/month	22	17	4	3	0.00	6.43	2.15	-	19.26
	Frequency \leq 1x/month	106	83	124	97		Ref			
3	Loba									
	Frequency \geq 2x/month	28	22	6	5	0.00	5.69	2.27	-	14.29
	Frequency \leq 1x/month	100	78	122	95		Ref			
4	Babi hutan									
	Frequency \geq 2x/month	42	33	11	9	0.00	5.20	2.53	-	10.67
	Frequency \leq 1x/month	86	67	117	91		Ref			
5	Babi putar									
	Frequency \geq 2x/month	39	30	10	8	0.00	5.17	2.45	-	10.92
	Frequency \leq 1x/month	89	70	118	92		Ref			
6	Posana									
	Frequency \geq 2x/month	19	15	5	4	0.01	4.29	1.55	-	11.87
	Frequency \leq 1x/month	109	85	123	96		Ref			
7	Babi asam manis									
	Frequency \geq 2x/month	38	30	12	9	0.00	4.08	2.17	-	9.27
	Frequency \leq 1x/month	90	70	116	91		Ref			
8	Babi bakar									
	Frequency \geq 2x/month	42	33	14	11	0.00	3.98	2.04	-	7.74
	Frequency \leq 1x/month	86	67	114	89		Ref			
9	Babi leylem									
	Frequency \geq 2x/month	47	37	17	13	0.00	3.79	2.15	-	7.67
	Frequency \leq 1x/month	81	63	111	87		Ref			
10	Sate babi									
	Frequency \geq 2x/month	106	83	76	59	0.00	3.30	1.88	-	5.88
	Frequency \leq 1x/month	22	17	52	41		Ref			
11	Sup babi kuah asam									
	Frequency \geq 2x/month	42	33	17	13	0.00	3.19	1.64	-	5.78
	Frequency \leq 1x/month	86	67	111	87		Ref			
12	Babi tore									
	Frequency \geq 2x/month	32	25	14	11	0.00	3.03	1.37	-	5.38
	Frequency \leq 1x/month	86	67	114	89		Ref			
13	Tina'i									
	Frequency \geq 2x/month	19	15	7	5	0.03	3.01	1.14	-	7.03
	Frequency \leq 1x/month	109	85	121	95		Ref			
14	Ikan mas wokublanga									
	Frequency \geq 2x/month	48	38	23	18	0.00	2.74	1.54	-	4.87
	Frequency \leq 1x/month	80	63	105	82		Ref			
15	Tikus									
	Frequency \geq 2x/month	23	18	10	8	0.02	2.59	1.18	-	5.68
	Frequency \leq 1x/month	105	82	118	92		Ref			

No	Variable	Case		Control		Value p	OR	[95% Conf. Interval]		
		N	%	n	%					
16	RW									
	Frequency \geq 2x/month	27	21	12	9	0.01	2.58	1.24	-	5.36
	Frequency \leq 1x/month	101	79	116	91		Ref			
17	Fried goldfish									
	Frequency \geq 2x/month	36	28	17	13	0.00	2.56	1.43	-	5.25
	Frequency \leq 1x/month	92	72	111	87		Ref			
18	Babi garo rica									
	Frequency \geq 2x/month	103	80	80	63	0.00	2.47	1.45	-	4.49
	Frequency \leq 1x/month	25	20	48	38		Ref			
19	Ikan mas bakar rica									
	Frequency \geq 2x/month	32	25	16	13	0.01	2.33	1.28	-	4.91
	Frequency \leq 1x/month	96	75	112	88		Ref			
20	Tinorangsak									
	Frequency \geq 2x /month	64	50	40	31	0.00	2.20	1.32	-	3.66
	Frequency \leq 1x /month	64	50	88	69		Ref			
21	Sup brenebon babi									
	Frequency \geq 2x/month	65	51	42	33	0.00	2.11	1.27	-	3.50
	Frequency \leq 1x/month	63	49	86	67		Ref			
22	Sayur pait ba'									
	Frequency \geq 2x/month	95	74	74	58	0.00	2.10	1.28	-	3.68
	Frequency \leq 1x/month	33	26	54	42		Ref			
23	Ayam santan									
	Frequency \geq 2x/month	35	27	20	16	0.01	2.03	1.22	-	4.33
	Frequency \leq 1x/month	93	73	108	84		Ref			
24	Babi kecap									
	Frequency \geq 2x/month	82	64	60	47	0.00	2.02	1.28	-	3.50
	Frequency \leq 1x/month	46	36	68	53		Ref			
25	Sayur kangkung tumis									
	Frequency \geq 2x/month	85	66	66	52	0.02	1.86	1.12	-	3.08
	Frequency \leq 1x/month	43	34	62	48		Ref			

Information: The bold words are dishes that have the highest OR values processed through multi-variate analysis.

Table 2. The end model of multivariate analysis through the logistic regression shows the main variables (dishes) that are high-risk to CHD occurrence

Variables	Odd Ratio	Std. Err.	Z	P> z	[95% Conf Interval]		
Babi putar	4.43	2.37	2.78	0.00	1.55	-	12.65
Kotey/ Sa'ut	7.15	5.24	2.69	0.00	1.70	-	30.08
Babi hutan	4.29	2.07	3.02	0.00	1.66	-	11.05
Smoking	2.76	0.99	2.82	0.00	1.36	-	5.61
Age	1.96	0.36	3.62	0.00	1.36	-	2.83
Sex	2.86	1.02	2.93	0.00	1.41	-	5.78
Hypertension	5.86	2.05	5.03	0.00	2.94	-	11.66

Table 3. The end model of logistic regression of eating habits and CHD occurrence after controlling other variables

Variables	Odd Ratio	Std. Err.	Value <i>p</i>	[95% Conf.Interval]		
Eating habits	5.39	1.68	0.00	2.93	-	9.93
Sex	3.29	0.99	0.00	1.83	-	5.94
CHD family history	2.45	0.79	0.01	1.31	-	4.60
Diabetes history	3.75	1.19	0.00	2.01	-	6.99

The relationship between eating habits of the Minahasans and the occurrence of CHD

In this research, eating habits were scored based on the frequency of saturated fatty acids consumed. The compositing of 41 dishes was carried out by multiplying eating frequencies (weighted) with the content of saturated fatty acid. The eating habit scores ranged from a minimum of 97 to a maximum of 922, with a mean value of 413.53 which was the the cut-off point. Eating frequency was categorized as 'frequent' if an individual consumed the dishes ≥ 2 x/month; and 'seldom' if an individual did that ≤ 1 x/month. Then a bivariate analysis was carried out, followed by a multivariate analysis through an interaction test and a confounding process, to find the actual effect of eating habits after being controlled by certain other factors (Table 3).²⁸

The actual effect of Minahasans' eating habits involving specific dishes that are rich in SFA on the occurrence of CHD is: people with 'frequent' eating habits have a 5.4 times higher risk of getting CHD (95% CI: 2.93-9.93) compared to those with 'seldom' eating habits, which takes into account variables such as sex, CHD family history, and diabetes mellitus.

Minahasan's eating habits involve the frequent consumption of highly saturated fatty acids. Thus, there are high risks of occurrence of CHD.^{6,9}

CONCLUSION

The saturated fatty acid content in Minahasan dishes was 0.01-10.46 % per 100 grams. From the 41 Minahasan dishes,

the ones that contained high saturated fatty acids (3.93-10.46 %/100 grams) were *tina'i*, *ayam santan*, *babi tore*, *babi bakar*, *brenebon babi*, *babi putar*, *babi garo rica*, *tinorangsak*, *pangi babi*, *paniki*, *babi asam manis*, *babi kecap*, *RW*, *babi hutan*, *babi leylem* and *sup kuah asam babi*. Meanwhile, dishes that contained low saturated fatty acids (0.01-3.92 % per 100 gram) were *tinutuan*, *sayur pait*, *kotey/sa'ut*, *ikan cakalang goreng*, *ikan laut wokublanga*, *ikan mujair bakar*, *ikan mujair goreng*, *ikan cakalang fufu saus*, *ikan mas bakar rica*, *ikan mas wokublanga*, *ikan mas goreng*, *kangkung tumis*, *tikus* and *sayur rica rodo*.

The high-risk dish accountable for a high occurrence of CHD is *babi putar*. People who consumed it ≥ 2 x/month had a 4.43 times higher probability of getting CHD compared to those who consumed it ≤ 1 x/month or never ate it, even taking into account the effects of age, sex, smoking, and hypertension, as well as the consumption of *babi hutan* and *saut/kotey*. Minahasans' eating habits with a 'frequent' score: \geq mean value, and have a 5.4 times higher risk for getting coronary heart disease compared to those with a 'seldom' score: $<$ mean value, taking into account certain factors such as sex, family CHD history, and diabetes mellitus.

SUGGESTIONS

- Special health promotion programs through the Health Promotion Section and the Non-transmittable Disease Treatment Section, with special focus on heart problems should be broadcast through various media such as the TV,

newspapers, and magazines in North Sulawesi Province. This will familiarize society with the results of this research, so that especially Minahasan people, will be aware of the types of dishes that should be guarded against especially for those who are at risk of CHD.

- Moreover, the Health Department should target Minahasans, so that they will prudently decrease their frequency of eating, as well as their consumption of high-risk dishes such as *babi putar*, *kotey/sa'ut*, and *babi hutan*. The local government, public and religious leaders should take an active responsibility in supporting this effort to reduce the causes of CHD by increasing the intake of vegetables and fruits such as *tinutuan* and *sayur pait*.
- Efforts among institutions such as the Health Department, centers for public health (*Puskesmas*), hospitals, and related public facilities and organizations should be coordinated in each region. This will increase the awareness among citizens to choose healthy food that will not be a risk to CHD.
- Among the seafoods available in Minahasa that do not contribute to CHD is tuna fish.

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