Cardiovascular disease risk profile in adult Chinese living in north Jakarta, Indonesia (with emphasis on coronary heart disease)

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A cross sectional study of cardiovascular disease risk profile, with emphasis on coronary heart disease, was carried out in North Jakarta, Indonesia. One hundred and six ethnic Chinese (47 men and 59 women) aged 25 years and over were recruited. There were high prevalences of overweight /obesity and hypertension, especially in men (32.6% and 48.8%, respectively). Current smokers were 12.2% of men and 3.9% of women. Hyperlipidaemia prevalence was 14.6% of men and 9.6% of women. Mean values of body mass index (BMI), waist-hip ratio (WHR), and blood pressure were significantly higher in men than in women. Body fatness and blood pressure in women significantly increased with age. In women, plasma total cholesterol and LDL cholesterol were associated with BMI, while triglyceride was associated with WHR. The study showed a high prevalence of CVD risk particularly in men, consistent with an unhealthy lifestyle. In this report, men were more likely to smoke and had poorer attitudes to health than did women.

Introduction

In Indonesia, for two decades, coronary heart disease (CHD) has been the dominant form of heart disease admitted to large government hospitals and identified in community prevalence studies. In 1986, cardiovascular disease (CVD), mostly CHD and hypertensive heart disease, accounted for 9.7% of all causes of death, third in rank order after lower respiratory tract infection and diarrhoea which affects mainly infants and children[1]. In the United States half a million persons die of heart attack each year[2]. Among adult Americans, CHD continues to be the cause of the greatest number of deaths[3]. In Europe, mortality from CHD is not uniform, either between countries or even within a single country[4,5].

Many 'risk factors' have been implicated in the causation of CHD; the mechanisms are not always well understood.

The increase in CVD prevalence suggests that CVD mortality and risk for it are influenced by environmental and genetic factors. The importance of ethnic difference in risk is illustrated by studies about CVD risk among Asian Americans by Klatsky and Armstong[6], and between American blacks and whites in the Minnesota Health Study[7].

To evaluate the role of genetics, one option is to study a single genetic group living in different cultures. The Ni-Hon-San Study showed that CHD prevalence and incidence rate tripled among Japanese one generation after their migration to California and doubled in Japanese men who migrated to Hawaii[8,9]. Chinese are relatively homogenous in genetic makeup. Their lifestyle and food habits are strongly influenced by traditional Chinese culture which has been passed on for more than 2000 years. In addition, Chinese have a long migration history and can be found in all major cities of the world. Choi et al (1990) reported that elderly Chinese immigrants to Boston had lower blood pressure and blood lipids compared to elderly American whites[10]. In the Melbourne Chinese Health Study of Hage et al (1992), Melbourne Chinese had a more favourable CVD risk profile compared with the general Australian population insofar as blood pressure and lipoprotein concentrations were concerned[11].

In Jakarta there are many who identify themselves as of "Chinese" descent, but who live in a cultural environment still Asian and, therefore, closer to Chinese than studies of coronary heart disease risk in Chinese who live in occidental cities.

Methodology

Study Design and Subjects

A cross sectional study of Chinese Indonesians living in Muara Karang, North Jakarta, a residential area of population where most of the population is of Chinese ancestry was conducted in 1994. The sample was devised from those who identified themselves as of "Chinese" descent, even if one parent was not of Chinese ethnicity. They were aged 25 years or over at the time of contact. Selection was achieved through the social network method in this ethnically homogenous area. Otherwise in Jakarta, the Chinese population is relatively dispersed and not accessible through a register. It is also difficult to distinguish them by their family names because most officially use Indonesian family names. The background and study objectives were introduced to one of the gymnastics associations in Muara Karang. The information was then spread by word of mouth to relatives and neighbours. After establishing eligibility, 126 persons, willing to participate were registered. Twenty persons failed to be respondents because they did not come for examination until the end of the data collection. 106 participants (47 men and 59 women), underwent clinical examination, anthropometric measurements, and blood examinations, but 13 respondents did not fill out the self-administered questionnaires. Finally, 93 persons, consisting of 41

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men and 52 women, were involved in all parts of the investigation.

Material and Methods

Data collection began in February, 1994, and was completed in June, 1994 using: (a) Self-administered questionnaires (b) Interview, (c) Clinical examination, (d) Anthropometric measurement, and (e) Blood examination.

Clinical examination, anthropometric measurement, and blood extraction were conducted at a fixed place in the study area. Clinical examination was carried out by a medical doctor. Blood investigations were done at the Clinical Laboratory of Cipto Mangunkusumo Hospital, Faculty of Medicine, University of Indonesia, Jakarta.

The questionnaires were compiled by respondents at home after an explanation as to how to fill them out, and about the 10- to 12-hours fasting procedure. Each participant had one week to complete these questionnaires. Venous blood extraction was done one week afterwards at the time the self-administrated questionnaires were returned. A single visit to subjects was made to cross check and clarify queries and missing information.

The main variables of the self-administrated questionnaire were a) demographic characteristics, and b) health, including general health, medical history, and health-related habits.

Anthropometric measurements included body weight, height, waist and hip circumference to calculate body mass index (BMI) and the waist-to-hip ratio (WHR) for the assessment of adiposity.

Body weight was obtained using an Electronic SECA Platform Scale with a capacity of 200 kg and a precision of 0.1 kg. The subject stood still on the centre of the platform with the body weight evenly distributed between both feet, unassisted, looking straight ahead, relaxed with light indoor clothing, without shoes and sweater. Weight was recorded to the nearest 0.1 kg.[12]

Body height was measured using the microtoise with a maximum height of 200cm. The subject stood on a flat horizontal surface with feet parallel and with heels, buttocks, shoulders and back of head touching the upright wall. The head was held comfortably erect, with lower border of the orbit of the eye in the same horizontal plane as the external canal of the ear. The arms hung loosely at the sides. The movable headboard was then gently lowered until it touched the crown of the head, the measurement was taken at maximum inspiration and was recorded to the nearest 0.1 cm[12].

Body mass index, an indicator of total body fatness, was calculated as body weight in kilograms divided by stature in squared meters. The limit for overweight was set at greater than 26 kg/m^2 for men and greater than 25 kg/m^2 for women[13].

To measure waist (W) and hip (H) circumferences, subjects wore minimum clothing to ensure the tape was correctly positioned. Waist circumference was measured at a midpoint between lower rib cage and iliac crest (this is now referred to as abdominal circumference A, by WHO); and hip circumference was measured at the level of maximum extension of the buttock. WHR, an indicator of abdominal fatness, was calculated as the waist circumference divided by the hip circumference.

All anthropometric measurements were made twice and later averaged.

Blood pressure was measured twice using a sphygmomanometer from the right upper arm, five minutes apart, with the subject resting supine.

Hypertension was defined in accordance with the classification of the WHO Expert Committee[14], namely diastolic blood pressure (DBP) $\geq$ 95 mmHg and/or systolic blood pressure (SBP) $\geq$ 160 mmHg, or that the individual was being treated with anti-hypertensive drugs.

Blood investigations in this study consisted of fasting glucose and plasma lipids (total cholesterol, triglyceride, and high density lipoprotein cholesterol (HDLC) with international standardisation using reference samples. Subjects were asked to fast overnight for 10 to 12 hours prior to the blood collection. The low density lipoprotein cholesterol (LDLC) level was calculated based upon the Friedewald formula[15].

Diabetes was diagnosed if there was a fasting blood glucose of 140 mg/dl or over or if the individual was being treated with insulin or oral hypoglycemic drugs[16].

A cardiovascular risk score was given for any one of the following: high blood pressure (DBP $\geq$ 95 mmHg), high blood cholesterol (plasma cholesterol $\geq$ 6.5 mmol/L), or cigarette smoking (smoking one or more cigarettes daily). The CVD point score prediction probability from all CVD risk factors was calculated using the Framingham Heart Study Coronary Heart Disease Risk Prediction Chart[17].

Data Analysis

Frequency distribution or cross-tabulation was performed to cross-check the data. Data files were edited to ensure the quality of data.

Descriptive analysis was used to report sampling distribution and its attributes for men and women. Percentages are used for categorical variables, and the mean, standard deviation, and percentiles for continuous variables.

Analysis of variance (ANOVA) was used to analyse differences between groups. Correlation analysis was used to assess interrelationships with and between blood lipid measurements. Step-wise regression was used to examine the associations of the risk factors.

Epi Info Ver.6.0 and SPSS statistical procedures were used for the data handling and analysis

Table 1. Characteristics of the study population by gender (%)

	Men (n=41)	Women (n=52)
Age in years		
25 to 34	4.9	9.6
35 to 44	12.2	25.0
45 to 54	29.3	40.4
55 to 64	43.9	15.4
65 and over	9.8	9.6
Marital status		
Married	90.2	84.6
Never married	4.9	1.9
Others	4.9	13.5
Religion		
Buddhist	73.2	71.2
Christian	26.8	23.1
Others	0.0	13.5
Heritage (Dialect group)		
Canton	31.7	17.3
Fukien	41.5	46.1
Hakka	12.2	9.6
Teochew	7.3	13.5
Others	7.3	13.5
Education level in years		
0 to 6	4.9	19.2
7 to 9	7.3	7.7
10 to 12	46.3	36.5
13 or more	41.5	36.5
Occupational status		
Professional	4.9	0.0
Administrative, clerical and sales	60.9	17.2
Trades and services	17.1	7.6
Domestic duties/others	17.1	73.1
Gross monthly household income in US $		
0 to 124	4.9	7.7
125 to 249	12.2	13.5
250 to 499	26.8	19.2
500 to 999	29.3	36.5
1000 to 2499	22.0	11.5
2500 or more	4.9	11.5

Ethical Considerations

Respondents were assured that any information provided by them would be kept strictly confidential and no individual person would be identified in any reports. An informed consent form was signed by all participants before blood collection.

Table 2. Percentile distributions for anthropometry, blood pressure, fasting plasma lipids and fasting whole blood glucose, by gender.

	n	Mean	SD	5%	95%
Stature (cm)					
Men	47	166.7	5.6	58.1	176.6
Women	59	154.2	4.9	144.2	162.3
Weight (kg)					
Men	47	69.2	8.9	56.2	85.8
Women	59	54.3	6.3	3.6	66.4
Body mass index (kg/m^{2})					
Men	47	24.9	2.7	21.0	30.1
Women	59	22.9	2.8	18.3	28.0
Waist circumference (mm)					
Men	47	866	83	727	999
Women	59	747	78	637	892
Hip circumference (mm)					
Men	47	945	66	864	1055
Women	59	928	66	825	1070
Waist-hip ratio					
Men	47	0.91	0.06	0.8	1.0
Women	59	0.80	0.06	0.7	0.9
Systolic blood pressure (mmHg)*					
Men	47	141	20.7	115	180
Women	59	130	25.7	100	190
Diastolic blood pressure (mmHg)					
Men	47	91	14.3	70	117
Women	59	82	12.2	65	100
Total cholesterol (mmol/L)					
Men	47	5.84	1.18	4.1	7.5
Women	59	5.81	1.20	4.1	8.0
HDL cholesterol (mmol/L)					
Men	47	1.13	0.32	0.7	1.7
Women	59	1.35	0.30	0.8	1.9
LDL cholesterol (mmol/L)					
Men	46	3.94	1.02	2.5	5.4
Women	57	3.76	1.05	2.1	5.7
Triglycerides (mmol/L)					
Men	46	1.55	0.65	1.0	3.1
Women	57	1.29	0.82	0.7	3.4
Fasting whole blood glucose (mg/dL)					
Men	47	73.2	32.1	51	95
Women	59	78.8	27.4	49	164

HDL, high density lipoprotein; LDL, low density lipoprotein; *, p<.05; **, p<.01; ***, p<.001

Results

Study Population Characteristics

Ninety percent of the study population were born in Indonesia. The average age was 53.6 ± 10.8 years for men and 49.20 ± 10.5 years for women. Most of the participants families came originally from the Southern province of China (Fukien and Canton). Men were more educated than women. Most men were administrative, clerical, or sales workers and most women were housewives. Other characteristics of the study population are shown in Table 1.

Cardiovascular risk-factor profile

The percentiles for CVD risk factors profile are shown in Table 2. The values for BMI, WHR, and blood pressure for men were significantly higher than for women. Women had significantly higher HDLC than men (p <.001). Both genders had a fairly low mean fasting whole blood glucose.

BMI, WHR and blood pressure tended to increase with age for women (Table 3). Women tended to have higher SBP than men after 54-years of age and showed a significant increase in both SBP and DBP with increasing age (p <.001 and p <.05 respectively).

Table 3. Distributions of continuous risk factors by age for men and women.

Measurement	Age (year)				
	25-34	35-44	45-54	55-64	≥65
Body mass index (kg/m^{2}) Mean ± SD					
Men	25.8±4.2	23.7±2.7	25.3±2.7	23.9±2.2	27.7±2.5
Women*	20.0±2.0	22.5±2.7	22.2±2.7	24.2±2.2	24.7±3.2
Waist-hip ratio Mean ± SD					
Men	0.95±0.06	0.90±0.08	0.92±0.07	0.91±0.06	0.93±0.05
Women**	0.78±0.05	0.79±0.04	0.79±0.04	0.83±0.07	0.88±0.05
Systolic blood pressure (mmHg) Mean ± SD					
Men	128±12	134±18	140±27	143±15	145±21
Women***	113±15	117±15	125±19	152±31	169±22
Diastolic blood pressure (mmHg) Mean ± SD					
Men	90±14	92±10	93±18	92±12	93±17
Women*	73±7	79±11	80±13	91±12	91±9
Total cholesterol (mmol/L) Mean ± SD					
Men	4.8±0.14	6.3±0.01	5.9±1.16	5.7±1.07	7.3±1.49
Women	5.0±0.40	5.2±0.95	6.1±1.44	6.3±0.66	5.8±1.09
HDL cholesterol (mmol/L) Mean ± SD					
Men	1.0±0.14	1.2±0.38	1.2±0.29	1.1±0.26	1.4±0.67
Women	1.2±0.22	1.3±0.35	1.4±0.27	1.2±0.29	1.4±0.27
Total/HDL cholesterol Mean ± SD					
Men	5.0±0.67	5.3±0.93	5.1±0.99	5.6±1.29	6.5±3.12
Women	4.3±0.40	4.3±1.59	4.4±1.08	5.3±1.08	4.3±1.24
LDL cholesterol (mmol/L) Mean ± SD					
Men	3.1±0.00	3.9±0.92	4.1±0.80	4.0±0.90	4.0±2.05
Women	3.2±0.21	3.3±0.80	4.0±1.25	4.2±0.51	3.7±1.09
Triglycerides (mmol/L) Mean ± SD					
Men	1.6±0.78	2.6±0.78	2.0±0.69	1.6±0.54	1.8±0.66
Women	1.4±0.42	1.1±0.42	1.5±0.71	1.9±0.56	1.6±0.60
Fasting whole blood glucose Mean ± SD					
Men	52±13.4	67±8.3	66±11.3	85±48.1	77±13.0
Women	69±4.6	71±17.2	78±23.4	84±37.0	97±42.3

Significance of a difference between men and women is indicated by *, p <.05; **, p<.01; ***, p <.001; HDL, high density lipoprotein; LDL, low density lipoprotein;

Table 4 shows the CVD risk factor prevalences of the study population. More men reported that they had high cholesterol or triglycerides than women, but more women had received treatment for hypercholesterolaemia and hypertriglyceridaemia than men. Only few men and women were suffering from diabetes mellitus. All subjects with diabetic history were also treated. Only few women were using oral contraceptive. More than 30% men had BMI value ≥26 kg/m^{2}. Almost 50% men had hypertension, but half of them were not aware of it. More than 50% men reported smoking for some time in their lives and about 80% of them had stopped smoking. Only a few women smoked. Regarding the overall CVD risk scores, 69.1% men and 42.4% women had at least one risk factor. The CVD risk profile for the study population is shown in Table 4.

Tables 5 and 6 show the correlation matrix of blood pressure, blood lipid, and age. In men, BMI was associated positively with DBP (p<.01) while WHR was associated positively with SBP (p<.01) and with BMI (p<.01). In women, triglyceride concentration was associated positively with cholesterol concentration (p<.01) and negatively with HDL cholesterol (p<.01). BMI was associated positively with blood pressure (p<.001) and cholesterol (p<.01) while WHR was associated with SBP (p<.01), triglyceride (p<.01), and BMI (p<.01). Age of women was positively associated with blood pressure and body fatness (BMI and WHR).

Multivariate analysis using step-wise regression models (Table 7) shows that the blood lipid profile of men was not associated with adiposity or age. In women, BMI was predictive of plasma total cholesterol. The LDLC model for women showed that BMI was predictive for LDLC and moved in the same direction as LDLC. Plasma triglycerides positively related to WHR in women ($p<0.05$). There were significant associations between age and WHR with SBP in men (adjusted $R^2 = 0.26$) and between BMI and DBP in women (adjusted $R^2 = 0.21$).

Table 4. Cardiovascular risk factor prevalence of the study population by gender (%).

	Men (n=41)	Women (n=52)
Self-reported medical history		
High blood pressure	26.8	13.5
High cholesterol or triglycerides	19.5	21.2
Angina	7.3	5.8
Diabetes	12.2	7.7
Receiving treatment for cardiovascular disease risk		
High blood pressure	17.1	11.5
High blood fat	7.3	13.5
Angina	0.0	3.8
Diabetes	12.2	7.7
Oral contraceptive use		
Now taking	-	3.8
No longer taking	-	21.2
Overweight or obese	32.6	16.7
Hypertension, defined by diastolic blood pressure and treatment		
On blood pressure tablets and DBP <95 mmHg	2.5	1.9
On blood pressure tablets and DBP ≥95 mmHg	14.6	9.6
Not on blood pressure tablets and DBP ≥95 mmHg	26.8	9.6
Total	43.9	21.1
Hypertension, defined by diastolic blood pressure, systolic blood pressure and treatment		
On blood pressure tablets and DBP <95 mmHg and SBP <160 mmHg	2.5	0.0
On blood pressure tablets and DBP ≥95 mmHg and/or SBP ≥160 mmHg	14.6	11.5
Not on blood pressure tablets and DBP ≥95 mmHg and/or SBP ≥160 mmHg	31.7	11.5
Total	48.8	23.0
Hyperlipidaemia		
Cholesterol ≥5.5 mmol/L	68.3	55.8
Cholesterol ≥6.5 mmol/L	31.7	28.9
Triglyceride ≥2.0 mmol/L	31.7	38.5
Cholesterol ≥5.5 mmol/L and triglyceride ≥2.0 mmol/L	14.6	9.6
Diabetes		
On treatment or/and blood glucose ≥ 140 mg/dL	12.2	7.7
Smoking status		
Smoker	12.2	3.9
Ex-smoker	39.0	3.9
Major CVD risk score		
No risk	31.7	57.7
One risk	51.2	36.5
Two risks or more	17.1	5.8

Table 5. Correlation matrix of blood pressure, blood lipid, and age of men. (*, p<.01; **, p<.001).

	SBP	DBP	CHOL	HDLC	LDLC	TRIG	BMI	WHR
DBP	.65**							
CHOL	.26	.19						
HDLC	.07	.11	.34					
LDLC	.24	.07	.83**	.04				
TRIG	-.11	.01	.19	-.23	.11			
BMI	.30	.35*	.13	-.18	.15	.21		
WHR	.42*	.29	.22	-.03	.13	.20	.43*	
AGE	.34	.19	.26	.24	.26	-.17	.10	.20

Table 6. Correlation matrix of blood pressure, blood lipid, and age of women.

	SBP	DBP	CHOL	HDLC	LDLC	TRIG	BMI	WHR
DBP	.81**							
CHOL	.24	.30						
HDLC	.10	.03	.28					
LDLC	.14	.22	.96**	.15				
TRIG	.29	.33*	.32*	-.33*	.14			
BMI	.43**	.46**	.38*	-.03	.36*	.27		
WHR	.38*	.26	.24	-.13	.20	.36*	.32*	
AGE	.65**	.39*	.26	.09	.18	.30	.42*	.52**

*, p<.01; **, p<.001

Table 7. Step-wise regression models of blood lipid and blood pressure, by gender.

Variable entered	Dependent variables				
	Chol	LDLC	Trig	SBP	DBP
Men (n=47)					
Age				0.27*	
BMI					0.34*
WHR				0.42**	
Adjusted R^2				0.26	0.09
Women (n=59)					
Age				0.65***	
BMI	0.34*	0.33*			0.48***
WHR			0.31*		
Adjusted R^2	0.09	0.09	0.08	0.41	0.21

Chol, cholesterol; LDLC, low density lipoprotein cholesterol; Trig, triglyceride; SBP, systolic blood pressure; DBP, diastolic blood pressure; *, p<0.05; **, p<0.01; ***, p<0.001

Table 8. The mean of 10-years CHD predicted probabilities for each age group in the population studied compare with average 10-years risk of Framingham population.

Age (years)	Men		Women	
	Mean of 10-year predicted risk	Average 10-year risk	Mean of 10-year predicted risk	Average 10-year risk
30 - 34	3	3	0	<1
35 - 39	5	5	0	<1
40 - 44	6	6	2	2
45 - 49	10	10	5	5
50 - 54	13	14	8	8
55 - 59	16	16	12	12
60 - 64	20	21	13	13
65 - 69	30	30	9	9
70 - 74	24	24	12	12

Using the Framingham Heart Study Coronary Heart Disease Risk Prediction Chart, the total points of CVD risk factors tended to be higher in older age groups ($p<.001$). Compared with the Framingham population, the average 10-year risks of this study population were similar (Table 8).

Discussion and conclusion

The prevalence of most CVD risk factors, was higher in males than in females. This study shows high prevalences of overweight and hypertension, especially in men. Women had a lower prevalence of cigarette smoking than men.

The mean blood cholesterol concentration, LDLC and triglyceride of the study population was relatively high and HDL cholesterol was relatively low compared to the lipid profiles of Chinese in Southern China[18] and Melbourne Chinese[11], where the majority of the study population came from Southern China.

High blood pressure is an established risk factor for coronary heart disease and stroke[19,20,21]. In this study, we found that almost 50% men had hypertension. Compared to Melbourne Chinese, the mean blood pressure of the Jakarta Chinese was relatively high. Of those defined as having hypertension and on treatment, most were inadequately controlled. This differed with the findings of the Melbourne Chinese study. Most Melbourne Chinese who received treatment had their blood pressure under control. Although there may be a genetic predisposition to hypertension in humans, its expression in Chinese seems very environmentally dependent.

Women were more aware of health status and services than men. The prevalence of treated CVD risk in women was higher than in men.

Body fatness is not only a risk factor for CVD, but also a risk factor for hypertension[22,23] and hyperlipidemia[24,25]. In this study, women were more responsive to the effect of adiposity on other CVD risk factors than men. In the current study, an increased BMI increased the risk of high DBP, total cholesterol, and LDLC; and increased abdominal fatness was associated with high blood triglyceride in women. In men, BMI was associated only with DPB.

Obesity is generally known to correlate negatively with serum HDL cholesterol[26]. In Melbourne Chinese, HDL cholesterol decreased with higher BMI or WHR both in men and women. In this study, this association was not found.

Age is an important factor in the examination of CVD risk factors. But in this study, only body fatness and blood pressure of women increased with advancing age. Other risk factors were not associated with age. But because increased body fat was related to the increase in some other risk factors in women, age became an important factor. Using the Framingham Heart Study Coronary Heart Disease Risk Prediction Chart, the total points for CVD risk tended to be higher in older age groups because all the CVD risk factors including age were included in the calculation.

In conclusion, this study showed a high prevalence of CVD risk, particularly in men which is likely to be due to their lifestyle. Men smoked more and had poorer attitudes to health status than did women.

Recommendation

Chinese Indonesians from further afield need to know their coronary risk. Studies to reduce risk in them and other Indonesians are now more important.

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居住在北雅加達的印尼華人心血管疾病危險因素（重點強調冠心病）

在印度尼西亞的北雅加達進行了以冠心病爲重點的心血管疾病危險因素的横斷面研究．通過對一百零六名25歲以上的華人（男性47名，女性59名）進行調查．發現調查對象中超重/肥胖和高血壓的現患率很高，特别是在男性中（分别爲32．5%、48．6%）．現吸烟率男性爲12.2%，女性爲3.9%．高血脂現患率男性爲14.4%，女性爲9.6%．男性的平均體重指數（ＢＭＩ）、腰臀比值（ＷＨＲ）和血壓明顯著高于女性．女性的體脂及血亞隨年齡的增加而增加．女性的血漿總膽固醇、低密度脂蛋白膽固醇與ＢＭＩ相關，而甘油三脂與ＷＨＲ相關．研究表明，伴隨不健康的生活方式，男性患ＣＶＤ的危險性很高．本研究還發現，男性比女性更容易吸烟，并對健康有更不正確的態度．

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