

Coronary risk factors among Malaysian male executives in two urban areas

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Summary

Four hundred and six Malaysian executives and professionals in two urban areas were screened for coronary risk factors. They comprised 44% Malays, 45% Chinese, 9% Indian and 3% other ethnic groups with ages ranging from 25-54 years of age. Risk factors surveyed included hypertension, hypercholesterolemia, smoking, obesity, diabetes, high density lipoprotein cholesterol, hypertriglyceridemia and hyperuricemia. Risk factors were found to be widely prevalent with more than half (51.5%) of the sample having one or more risk factors.

Malays had a significantly higher prevalence of hypercholesterolemia, overweight, obesity, low HDL cholesterol, hypertriglyceridemia and hyperuricemia when compared to Chinese.

Risk factor levels in the subjects studied were comparable to those for western industrialised societies.

Introduction

Available statistics suggest that cardiovascular disease is a major cause of death in Peninsular Malaysia. In 1982, of the 24,198 medically certified deaths, 28% were due to cardiovascular disease. Ischaemic heart disease accounted for about one third (31%) while cerebrovascular disease accounted for another 30%. From 1980-1984, "heart disease" was the principal cause of death in government hospitals. It was the fourth major cause of admission into government hospitals in Peninsular Malaysia in 1982. Though the reliability of statistics on cardiovascular disease in Peninsular Malaysia is affected by a proportion of reported deaths not being medically certified,¹ the impression is that cardiovascular disease is probably an important cause of mortality and morbidity in Peninsular Malaysia and coronary heart disease accounts for a major portion of it.

Studies of large populations have identified a number of risk factors that are associated with coronary heart disease. Of these, elevated blood pressure, high blood cholesterol levels and cigarette smoking are the most clearly established.² Risk tends to increase with age and men are at greater risk. Other important risk factors are diabetes mellitus, obesity, and low levels of high density lipoprotein cholesterol, while the position of hypertriglyceridemia and hyperuricemia as independent risk factors is more controversial.

Few studies on risk factors have been done on Asian populations. In Malaysia, information on the prevalence of these factors is scarce. This study was undertaken between 1982-1985 to estimate the prevalence of risk factors in the middle and upper income sector of two urban communities that are in close geographical proximity.

Materials and Method

During the period 1982-1985, 406 Malaysian male executives and professionals employed in the private and public sector in Kuala Lumpur and Petaling Jaya were screened. They comprised Malays, Chinese, Indians and other ethnic groups. Recruitment into the program was on a voluntary basis usually through liaison with the personnel department of the company or agency concerned.

All participants were interviewed by a doctor. Those with a history or symptoms of coronary heart disease were excluded. A questionnaire was filled which included demographic data and relevant medical and smoking history. Body weight, height and blood pressure were recorded. A fasting sample of venous blood was taken for measurement of lipids, blood sugar, and uric acid levels.

Subjects received a personalised report which was mailed directly to them. Where relevant, they were advised to see their doctor. This was usually recommended if they had multiple risk factors or a single risk factor which was severe.

Data analysis was aided by a DIGITAL VAX 11-730 computer using a Statistical Analysis System (SAS) package.

Smokers were defined at two levels: 1) those who regularly smoke one or more cigarettes a week and 2) those who smoke more than 10 cigarettes a day. Those who had a past history of smoking were not included. Pipe and cigar smokers were very small in number and were not included in data analysis.

Height and weight were measured using a SECA beam balance with a height attachment. Body Mass Index (BMI) was obtained from a nomograph. Participants with a BMI of 25-30 kg/m² were considered overweight while a BMI above 30 kg/m² was considered obese.³

This was measured in the sitting position with no systematic rest period before the measurement nor was there any follow up to confirm elevated blood pressure readings. For the purpose of this study, all persons on treatment for hypertension, plus all persons not on treatment but with a diastolic blood pressure of 95 or more were defined as "hypertensive".

Subjects on treatment for diabetes and those not on treatment but with a fasting blood glucose level of 140mg/dl or more were considered diabetic, in accordance with WHO recommendations (1980).⁴

All participants were instructed to fast for 12 hours prior to venepuncture. Total cholesterol and triglyceride concentration were determined using the Technicon Autoanalyser II from iso-propanol extract of serum treated with zeolite mixture. High density lipoprotein

cholesterol concentrations were measured by the method described by Warnick and Albers with a modification using a twofold increase in the concentration of the manganese chloride heparin combined reagent. The results were expressed as %HDL cholesterol (the percent of HDL cholesterol to total cholesterol). Low density lipoprotein cholesterol was calculated using the Friedewald formula as follows:-

LDL chol. = Total cholesterol - 1/5 Triglycerides - HDL chol.

Uric acid was analysed by the phosphotungstate reduction method. The glucose oxidase method using a glucose analyser was used to determine glucose concentration.

Results

The ages of the subjects ranged from 25-54 years with a mean age of 37±6 years. Of these, 44% were Malays, 45% Chinese, 9% Indian and 3% other ethnic groups. 73% held administrative, executive or managerial posts while professionals comprised 27%. The majority (60%) earned between \$2000-\$5000 monthly, while 20.7% earned more than \$5000 per month. More than two-thirds (69.9%) had at least a basic university education or postgraduate qualifications. The remainder had secondary school, technical, or other tertiary (eg. diploma) qualifications.

Mean values of selected risk factors stratified by age and ethnic group are shown in Table 1. Total cholesterol, triglyceride and fasting glucose levels increase with age. Mean serum uric acid level and %HDL cholesterol do not exhibit any age trend. The mean values for body weight, body mass index, total cholesterol, triglycerides, LDL cholesterol, fasting blood sugar and serum uric acid are higher for Malays as compared to Chinese subjects. In addition, mean %HDL cholesterol is lower among the Malays.

The prevalence of selected risk factors including those of the three major risk factors at conventional cut off points (Total cholesterol >250mg/dl, blood pressure of 95mm Hg or more or on treatment for hypertension, smoking >10 cigarettes per day) are displayed by age in Table 2. All show a rising trend with age with the exception of serum uric acid and cholesterol. According to these criteria, 30.8% of the entire sample had hypercholesterolemia, 23.4% smoked more than 10 cigarettes a day and 10.9% were hypertensive. There is an appreciable prevalence of most of the risk factors in the 25-34 age group.

The prevalence of these same risk factors is shown distributed by ethnic group in Table 3. Malay subjects have a higher prevalence of hypercholesterolemia, overweight, obesity, low HDL cholesterol, hypertriglyceridemia and hyperuricemia when compared to Chinese subjects.

Taking the three major risk factors: hypertension, hypercholesterolemia and smoking (Table 4) 39.4% of all subjects had 1 risk factor, 10.6% had 2 risk factors and 1.5% had 3 risk factors. 51.5% had 1 or more of these three risk factors. An age trend is noted – the percentage with 1 or more risk factors increasing from about 40% in the 25-34 year age group to 59% by 45-54 years. 40% of subjects in the youngest (25-34) age group have 1 or more risk factors. 57.4% of Malay subjects had 1 or more risk factors as compared to 45.1% of Chinese subjects.

The body mass index was associated positively with diastolic blood pressure ($r=0.31$; $p<0.001$), fasting triglycerides ($r=0.31$; $p<0.001$), serum uric acid ($r=0.26$; $p<0.001$) and inversely with %HDL cholesterol ($r=-0.29$; $p<0.001$).

Discussion

Coronary risk factors are widely prevalent among executives and professionals in the urban areas

surveyed. 36.9% of all subjects regularly smoked one or more cigarettes a week. Of this number, 63.3% smoked more than 10 cigarettes a day. In the Framingham study, men smoking more than 10 cigarettes a day had distinctly higher deaths and CHD rates.⁵ It is of concern to note that cigarette smoking was the most widely distributed of all the risk factors.

Of particular interest was that the mean cholesterol levels of all age groups exceeded the value of 220mg/dl. Though the conventional cut-off point for hypercholesterolemia is 250mg/dl, the Pooling Project² and the Seven Countries Study⁶ have shown that the risk for coronary heart disease increases after 220mg/dl.

There appears to be significant ethnic differences in the prevalence of risk factors when Malays are compared to Chinese. Cultural, dietary or constitutional factors are possible, but further research is needed. A higher rate of coronary heart disease would be expected among Malays if this is the case. It is unfortunate that actual rates of coronary heart disease in Malaysia are not known to enable comparison. A prospective study of these subjects would be useful.

Though the number of subjects with all 3 major risk factors (hypertension, hypercholesterolemia and smoking) is small (1.5%), the number with 1 or more of the 3 risk factors includes more than half (51.5%) the entire sample. Furthermore, it is of significance that 40% of subjects in the youngest age group should have 1 or more risk factors. In the sample as a whole, the major contributors to risk are hypercholesterolemia and smoking. Hypertension does not appear so prevalent, probably because the major portion of the sample fell between the ages of 25-44 years.

Several of the risk factor levels determined are comparable with those reported for other more industrialised countries. Data from the Office of Population Censuses and Surveys Monitor⁷ show that in 1982, the prevalence of cigarette smoking (excluding ex-smokers and occasional smokers) among British men was 38%. This is close to the 37% found for all subjects (Table 2) in this study. The mean level of total cholesterol among white males in the United States for the period 1976-1980⁸ was 216.6mg/dl. A mean level for total cholesterol of 232.3mg/dl was found for the subjects of this study (Table 1).

The risk factors studied in this paper are those that are capable of reasonably objective measurement. However there are shortcomings from the epidemiologic point of view. The sample was not random and the number of subjects was not large. The number of Indian subjects particularly was too small for valid comparison. Furthermore, the possibility of selection bias cannot be excluded. It is also admitted that over the period taken for the study, the measurement error in the various observations may have varied. The criteria for diabetes was based on assessment of fasting blood glucose level. Although such single blood sugar determinations have their limitations, Barrett-Connor⁹ adopts a similar level and notes that though it is not a very sensitive cut-off, it has good specificity. Thus few persons with a fasting glucose level of 140mg/dl or more are likely not to have diabetes. We would however expect it to underestimate the actual prevalence of diabetes since not all diabetics have fasting hyperglycemia.¹⁰ Nevertheless, within the limits imposed by these considerations, it is not unrealistic to suppose that the results are fairly reflective of the status of coronary risk in the middle and upper income sectors of the community as a whole in the urban areas surveyed.

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Table 1

Selected parameters by age and ethnic groups of 406 males*

PARAMETER	Age groups (years)				Ethnic groups		
	25-34	35-44	45-54	All ages	Malay	Chinese	Indian
Total number(n)	146	209	51	406	176	182	37
Weight (kgs)	66.6 ± 8.4	68.1 ± 8.5	68.2 ± 9.6	67.6 ± 8.6	68.4 ± 8.7	66.5 ± 8.4	69.5 ± 8.6
BMI	23.3 ± 2.8	24.0 ± 2.5	24.5 ± 3.1	23.8 ± 2.7	24.4 ± 2.9	23.2 ± 2.5	23.8 ± 2.6
Diastolic blood pressure	77.6 ± 7.3	82.1 ± 9.6	82.5 ± 8.4	80.5 ± 8.9	80.3 ± 9.6	81.2 ± 8.2	77.7 ± 9.5
Total cholesterol (mg/dl)	224.4 ± 41.6	236.0 ± 46.2	239.3 ± 39.7	232.3 ± 44.1	236.1 ± 42.4	226.5 ± 45.6	247.1 ± 41.5
Triglycerides (mg/dl)	133.0 ± 70.0	164.2 ± 95.3	172.2 ± 85.3	153.9 ± 87.0	160.3 ± 77.1	146.7 ± 98.2	159.2 ± 75.0
LDL cholesterol (mg/dl)	155.5 ± 39.8	163.6 ± 40.6	162.9 ± 36.0	161.0 ± 40.0	165.4 ± 38.7	153.7 ± 41.1	175.0 ± 33.0
%HDL cholesterol	19.7 ± 7.0	17.5 ± 5.1	17.4 ± 5.9	18.3 ± 6.0	16.7 ± 4.7	19.9 ± 6.9	17.0 ± 5.1
Serum uric acid (mg/dl)	6.8 ± 1.4	6.9 ± 1.4	6.8 ± 1.5	7.0 ± 1.4	7.0 ± 1.4	6.8 ± 1.5	6.6 ± 1.2
Fasting blood glucose (mg/dl)	88.1 ± 8.6	92.7 ± 13.4	95.6 ± 19.1	91.4 ± 13.0	92.8 ± 15.3	90.2 ± 11.1	90.9 ± 10.1

* Values expressed as mean ± S.D.

Other ethnic groups (n = 11) not included owing to small number of subjects.

Table 2

Prevalence of risk factors by age (% frequency)

AGE GROUP	Hypertensive	Cholesterol >250mg/dl	Smoking >10/day	Smoking 1 or more/wk	Overweight BMI = 25-30	Obese BMI>30	Diabetic	%HDL Chol <15	Triglycerides >190mg/dl	Uric acid >7.5mg/dl
25-34 yrs n = 146	2.8	23.3	20.5	36.3	26.2	2.8	0.7	23.3	20.6	29.1
35-44 yrs n = 209	14.8	35.9	23.9	36.8	29.3	1.9	2.9	30.4	27.3	31.2
45-54 yrs n = 51	17.6	31.4	29.4	39.2	33.3	5.9	4.1	33.3	34.0	17.1
All ages n = 406	10.9	30.8	23.4	36.9	28.7	2.7	2.2	28.2	25.7	28.7

Table 3

Prevalence of risk factors by ethnic group (% frequency)*

ETHNIC GROUP	Hypertensive	Cholesterol >250mg/dl	Smoking >10/day	Smoking 1 or more/wk	Overweight BMI = 25-30	Obese BMI>30	Diabetic	%HDL Chol <15	Triglycerides >190mg/dl	Uric acid >7.5mg/dl
Malay n = 176	12.6	35.2	25.6	38.1	36.8	4.6	4.0	36.6	31.3	35.3
Chinese n = 182	10.4	24.2	20.9	35.7	21.4	1.1	1.1	19.7	19.9	25.4
Indian n = 37	8.1	43.2	24.3	35.1	32.4	2.7	0	35.1	27.0	14.3
Significance of difference between Malay and Chinese subjects+	NS	<0.025	NS	NS	<0.01	<0.05	NS	<0.005	<0.02	<0.05

+ Derived using Chi-square test (with one degree of freedom)

NS denotes not significant.

* Other ethnic groups (n = 11) not included owing to small number of subjects.

Table 4

Percentage frequency with the 3 major risk factors*

	Number of risk factors				
	None	One	Two	Three	One or more
Ethnic groups:					
Malay (n = 176)	42.6	43.8	11.4	2.3	57.4
Chinese (n = 182)	55.0	35.2	9.3	0.6	45.1
Indian (n = 37)	43.2	40.5	13.5	2.7	56.8
Age groups (yrs)					
25-34 (n = 146)	59.6	34.3	6.2	0	40.4
35-44 (n = 209)	42.6	42.1	13.4	1.9	57.4
45-54 (n = 51)	41.2	43.1	11.8	3.9	58.8
All ages (n = 406)	48.5	39.4	10.6	1.5	51.5

* Hypertension, hypercholesterolemia (>250mg/dl) and smoking (>10 cigarettes/day). Other ethnic groups (n = 11) not included owing to small number of subjects.

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References

1. Lau L. Medical certification of cause of death in Peninsular Malaysia. *Med J Malaysia* 1976; 30: 179-184.
2. The Pooling Project Research Group. Relationship of blood pressure, serum cholesterol, smoking habit, relative weight and ECG abnormalities to incidence of major coronary events: Final report of the Pooling Project. *J Chronic Dis* 1978; 31: 201-306.
3. Bray AG. Obesity: definition, diagnosis and disadvantages. *Med J Aust* 1985; 142 (7 suppl): S2-8.
4. WHO expert committee on Diabetes Mellitus. *WHO Technical Report Series* No. 646. Geneva: World Health Organisation, 1980.
5. Gordon T, Kannel WB, McGee D, Dawber TR. Death and coronary attacks in men after giving up cigarette smoking – a report from the Framingham study. *Lancet* 1974; 1: 1345-1348.
6. Oliver MF. Serum cholesterol – the knave of hearts and the joker. *Lancet* 1981; 2: 1090-1095.
7. Simpson D. Trends in major risk factors: cigarette smoking. *Postgrad Med J* 1984; 60: 20-25.
8. Rowland ML, Fulwood R. Coronary heart disease risk factor trends in blacks between the first and second National Health and Nutrition Examination Surveys, United States, 1971-1980. *Am Heart J* 1984; 108: 771-779.
9. Barret-Connor E. The prevalence of diabetes mellitus in an adult community as determined by history or fasting hyperglycemia. *Am J Epidemiol* 1980; 111: 705-712.
10. Remein QR, Wilkerson HLC. The efficiency of screening tests for diabetes. *J Chronic Dis* 1961; 13: 6-21.