Prevalence of Cardiovascular Disease Risk Factors Among Attendees of the Batu 9, Cheras Health Centre, Selangor, Malaysia

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SUMMARY

This study describes the prevalence of selected cardiovascular disease (CVD) risk factors screened in patients 30 years and above attending a health centre in Cheras, Selangor. The study involved 3772 patients screened from March 2002 to June 2008. Risk factors screened included blood pressure, height, weight, serum total cholesterol, random blood sugar levels and smoking status.

Majority of respondents were between 40 and 49 years of age (58.1%), males (64.7%) and ethnic Malays (74.4%). About two thirds (62.6%) were found to be overweight or obese, two fifths (40.2%) had hypercholesterolemia, a third (34.2%) had hypertension and 31.6% were smokers at some time. Overall 87% and 60% had at least one and two CVD risk factors respectively. Prevalence of four of the five risk factors screened was highest among the Malay middle aged men and lowest among the Chinese.

Thus a substantial proportion of middle aged men were at high risk of CVD. Our findings show the need for ongoing monitoring of CVD risk factors and implementation of effective preventive strategies.

KEY WORDS:
Cardiovascular disease, Risk factors, Screening, Prevalence, Selangor Malaysia

INTRODUCTION

Chronic disease burden is a rapidly increasing worldwide phenomena. In 2001, chronic diseases formed 46% of the global burden of disease and 60% of the 56.5 million total reported deaths. Half the mortality statistics were attributable to chronic diseases[1].

In 2003, the World Health Report emphasized that the total global deaths from cardiovascular disease (CVD) contributed to 16.7 million (29.2%) deaths and 80% of these were in low and middle income countries[2]. In 2005, deaths from cardiovascular diseases were 17.5 million (30%) of which 7.6 million were due to coronary heart disease (CHD) and 5.7 million due to stroke. It is estimated that cardiovascular disease will be the leading cause of death globally and by 2015, cardiovascular deaths could reach 20 million[3].

Many of the modifiable risk factors for CVD are behavioural in nature. These are mainly an unhealthy diet, physical inactivity and tobacco use. These behavioural factors may show up in individuals as raised blood pressure, raised blood glucose, raised blood cholesterol and obesity. These major risk factors have been responsible for 80% of coronary heart disease and cerebrovascular disease[3].

The increasing burden of cardiovascular diseases has important economic implications in a global context. In 2008, the direct and indirect costs in the United States of America was estimated to be USD448.5 billion[4]. In 2009, it was estimated to escalate to USD475.3 billion[5]. The United Kingdom was estimated to have incurred an overall cost of GBP 30.7 billion in 2006[6]. In 2005, Malaysia spent RM215.9 million on antihypertensive medication with cost per admission of managing hypertension estimated at around RM2927 (without comorbidity and complications). This did not include cost of admission for myocardial infarct, renal failure or heart failure where hypertension may have been an underlying cause[7].

The CVD screening programme in health centres was initiated by the Ministry of Health in view of providing effective treatment and improvement in prognosis of lifestyle related diseases like cardiovascular disease and diabetes mellitus. In March 2002, this programme was introduced in Klinik Kesihatan Batu 9 Cheras, which caters to a population of around 250,000 people.

The current study was conducted at the above health centre and the main objective was to determine the distribution and prevalence of CVD risk factors among the health centre attendees from March 2002 to June 2008. This study also aimed to determine the relationship of these modifiable risk factors with selected socio-demographic characteristics.

MATERIALS AND METHODS

Secondary data was reviewed for patients who had taken part in a cardiovascular disease (CVD) screening program at the Klinik Kesihatan Batu 9, Cheras, Selangor from March 2002 till June 2008. The inclusion criteria were no previous history of cardiovascular risk factors namely diabetes, hypertension and hypercholesterolaemia, and adults aged 30 years and above attending the clinic. Respondents were requested for

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verbal consent before participating in the screening program. Screening included measurement of parameters such as body weight and height for body mass index (BMI), blood pressure measurements (both systolic (SBP) and diastolic (DBP)), random blood glucose (RBS), total serum cholesterol (TChol) and eliciting the smoking status of the respondent. All the equipment used to measure the various parameters were calibrated according to stipulated specifications. Respondents who were positive for any of the risk factors in the program were referred to the physician for further management.

1. Measured Parameters

A. Random Blood Glucose

The one touch horizon glucometer (Johnson and Johnson, USA) was used to measure the random blood glucose level. A random blood sugar level of 8 - <11mmol/L was classified as impaired while ≥ 11 mmol/L was considered diabetic. All respondents with an RBS of ≥ 8 mmol/L were classified as having an undesirable blood sugar level and were referred for further investigation and management.

B. Total Serum Cholesterol

The Accutrend GCT (Roche Diagnostics, Germany) was used to measure the total serum cholesterol level. A TChol level of ≥ 5.2mmol/L was classified as elevated.

C. Blood Pressure Measurements

Blood pressure measurements were taken sitting down after the patients had rested for five minutes. Two readings were taken for each patient. The readings were taken one minute apart and the average was recorded. The readings were taken by two dedicated staff, namely a staff nurse and an assistant nurse. Both were provided with adequate training prior to the screening program.

Hypertension (HPT) was diagnosed using the JNC VII[13] classification: Diastolic blood pressure (DBP) of ≥ 90 mm Hg and/or Systolic pressure (SBP) of ≥140 mm Hg.

Respondents having an elevated SBP (≥140 mmHg) with a DBP of < 90mmHg were classified as having isolated systolic hypertension, while those having an elevated DBP (≥90 mmHg) with a SBP of <140 mmHg were classified as having isolated diastolic hypertension.

D. Weight and Height measurements for Body Mass Index (BMI)

Weight (to the nearest 0.1 kilogram) was measured using the electronic floor weighing scale and height (to the nearest centimeter) was measured with fixed stadiometers (Seca, Vogel & Halke, Germany). The height and weight were measured with the patient barefooted. The body mass index was calculated as weight (kg) divided by the square of the height (m). Overweight was defined as a BMI of ≥ 25 – 29.99 kg/m² and obesity as ≥30 kg/m².

E. Smoking Status

Those screened were asked about their smoking status. Non-smokers were those who had never smoked cigarettes, cigars or pipe in their lives. Ex-smokers were those who had smoked in the past, but had stopped and were not currently smoking. Current smokers were those currently smoking on a regular basis.

2. Statistical analysis

All the above variables were included in the analysis as modifiable CVD risk factors (RF). The variable "at least one risk factor (RF)" was derived from the above variables based on the frequency of respondents having at least one of the five risk factors above. For smoking, this did not include ex-smokers.

Statistical analysis was conducted using the SPSS version 16 programme. Mean values, standard deviations and percent prevalences were defined using descriptive statistics. Means were compared using independent t-test and one-way ANOVA. Simple logistic regression and multivariate analysis were used to derive the crude and adjusted strength of association between the variables in the study. All tests were two-tailed with significance defined as $p < 0.05$.

RESULTS

A total of 3772 individuals were enrolled into the study. Respondents had a mean age of 46.9 years (SD 7.86). The mean (SD) and range for the other measurable risk factors were as follows:

RBS 6.5 mmol/L (2.78), 2.3-32.4 mmol/L; BMI 26.6 kg/m² (4.63), 14-54 kg/m²; TChol 5.2 mmol/L (0.89), 2.4-11.9 mmol/L; SBP 123.7 mmHg (13.85), 90-205 mmHg; and DBP 82.4 mmHg (8.66), 50-140 mmHg.

Majority of the respondents were between 40 and 49 years of age (58.1%), male (64.7%) and of the Malay race (74.4%). Table I illustrates the frequency distribution of the respondents by socio-demographic and the risk factor characteristics.

Prevalence of risk factors

While two thirds (62.6%) of the respondents were classified as overweight / obese, the majority did not have any of the other risk factors. However, about two fifths (40.2%) of the respondents were found to have hypercholesterolaemia, slightly over a third (34.2%) had hypertension and 31.6% were current or ex-smokers.

Of the five modifiable CVD risk factors, the majority of respondents (32.0%) had two risk factors. Only 13.2% had no risk factor at all. Overall, over 86% and about 60% had at least one and two risk factors respectively.

Respondents aged 60 years and above had the highest mean SBP, while those aged 40-49 years had the highest mean DBP and BMI. The mean TChol level of the age groups ranged from 5.1 to 5.2 mmol/L. For RBS, the highest mean was among those aged 50-59 years. Males had the highest mean for SBP, DBP, RBS and TChol. Indians had the highest mean RBS, while for the rest of the risk factors, Malays had the highest mean levels (Table II).

The prevalence of hypertension and elevated RBS increased steadily from age 30-39 years to 50-59 years, declining thereafter. For undesirable BMI and smoking, the prevalence was highest among respondents aged 40-49 years, while for hypercholesterolaemia, the prevalence displayed a gradually increasing trend from age 30-39 years to 60 years and above (Table III).

For all the risk factors, males had a higher prevalence. Almost two thirds of males had an elevated BMI, while the least prevalent risk factor was elevated RBS (20.3%). Elevated BMI was also the most prevalent risk factor among females. However, unlike males, smoking was least prevalent with only about 2% of females being current smokers.

The prevalence of all risk factors, except RBS, was highest among Malays and lowest among the Chinese. Elevated RBS was most prevalent among Indians.

The prevalence of having at least one risk factor was lowest among respondents aged 30-39 years reaching a maximum among respondents aged 40-49 years, thereafter showing a gradual decline. Males (92%) and Malays (90%) also had the highest prevalence of having at least one RF compared to females and other races (Chinese and Indian) respectively (Table III). Figures 1 to 3 show the frequency distribution of the number of risk factors by age, sex and race.

Bivariate analysis

Using ANOVA, the mean SBP, DBP, RBS and BMI were found to be significantly different ($p<0.001$) by age group. There was no difference for mean TChol ($p=0.225$). Age, sex and race were found to be significantly associated with each of the five modifiable risk factors. Among all risk factors, the strongest crude association for age and sex was with smoking, while race had the strongest association with BMI (Table IV).

For having at least one RF, respondents aged 40-49 years, males and Malays had the strongest significant association compared to respondents aged 30-39 years, females and Chinese respectively. The relationship between selected modifiable risk factors was also examined. Hypertension was found to be more likely among respondents with elevated TChol, RBS and BMI. Smoking and BMI were both associated with elevated TChol and elevated RBS.

Multivariate analysis

After adjusting for age, sex and race by multivariate analysis, RBS and smoking were found to be significantly associated with these independent variables. Hypertension, serum cholesterol and BMI were significantly associated with age and race only (Table V). Respondents aged 60 years and above were more likely to have hypertension and hypercholesterolaemia, while respondents aged 50-59 years were more likely to have elevated RBS and BMI. For smoking, those aged 40-49 years had the highest likelihood to be current smokers.

After adjusting for age and race, sex was significantly associated with elevated RBS and smoking. The males were almost 37 (95% CI 24.4 - 54.6) times more likely to be smokers compared to females. Elevated RBS was twice as likely in males compared to females. Malays were more likely to have hypertension and hypercholesterolaemia compared to Chinese after age and sex adjustment. They were also at least twice as likely to smoke compared to Indians. Conversely, Indians had the highest likelihood for elevated RBS. Both Malays and Indians had similar likelihood for elevated BMI compared to Chinese.

After adjusting for age, sex and race, the likelihood of having at least one RF was significant only for sex and race. Males were 2.5 times more likely than females, while Malays and Indians were 2.8 and 2.4 times more likely than Chinese to have at least one RF.

BMI was significantly associated with hypertension (aOR 2.8; 95% CI 2.4 - 3.3), elevated TChol (aOR 1.4; 95% CI 1.2 -1.6) and RBS (aOR 1.4; 95% CI 1.1 - 1.7) after adjusting for age, sex and race. For TChol and RBS, respondents with elevated levels of either of these parameters were 1.4 times (95% CI 1.2 - 1.6 and 1.1 - 1.6 respectively) more likely to have HTP compared to those having desirable levels after age, sex and race adjustments. Smokers were found to be less likely to have HPT (aOR 0.8; 95% CI 07 - 0.9) and an elevated BMI (aOR 0.7; 95% CI 0.6 - 0.9) compared to non-smokers after adjusting for age, sex and race.

Table I: Frequency Distribution of the Study Sample by Socio-Demography and Modifiable CVD Risk Factors

Age (n=3772)	Frequency	Percentage (%)
30-39	462	12.2
40-49	2191	58.1
50-59	855	22.7
60+	264	7.0
Sex (n=3772)		
Male	2439	64.7
Female	1333	35.3
Race (n=3772)		
Malay	2805	74.4
Chinese	561	14.9
Indians	394	10.4
Others	12	0.3
Blood Pressure (n=3765)		
Normotensive	2479	65.7
Isolated Systolic HPT	96	2.5
Isolated Diastolic HPT	656	17.4
Both systolic and diastolic HPT	534	14.2
RBS (n=3715)		
Desirable (<8 mmol/L)	3100	83.4
IGT (8-<11 mmol/L)	420	11.3
Diabetic (≥11 mmol/L)	195	5.2
BMI (n=3741)		
Underweight (<18kg/m^2)	62	1.7
Ideal (<25 kg/m^2)	1337	35.7
Overweight (25-<30kg/m^2)	1626	43.5
Obese (≥30kg/m^2)	716	19.1
Serum Cholesterol (n=3589)		
Desirable (≤5.2 mmol/L)	2147	59.8
Elevated (>5.2 mmol/L)	1442	40.2
Smoking status (n=3714)		
Non smoker	2540	68.4
Ex-smoker	114	3.1
Current smoker	1060	28.5
Number of Risk Factors (n=3391)		
None	446	13.2
One	914	27.0
Two	1086	32.0
Three	691	20.4
Four	220	6.5
Five	34	1.0

Table II: Mean Values for CVD Risk Factors by Age

	SBP (mmHg) (95% CI)	DBP (mmHg) (95% CI)	RBS (mmol/L) (95% CI)	TChol (mmol/L) (95% CI)	BMI (kg/m2) (95% CI)
Overall	123.7	82.4	6.5	5.2	26.6
	(123.2-124.1)	(82.1-82.7)	(6.5-6.6)	(5.2-5.2)	(26.5-26.7)
Age					
30-39	119.1	79.8	6.1	5.1	26.4
	(117.9-120.2)	(78.9-80.7)	(5.8-6.3)	(5.0-5.2)	(26.0-26.9)
40-49	123.0	82.9	6.6	5.2	26.9
	(123.4-124.6)	(82.5-83.2)	(6.5-6.7)	(5.2-5.2)	(26.7-27.1)
50-59	124.7	82.8	6.8	5.2	26.5
	(123.8-125.6)	(82.2-83.3)	(6.6-7.0)	(5.2-5.3)	(26.2-26.8)
60+	125.9	82.1	6.1	5.2	24.8
	(123.9-127.9)	(81.0-83.1)	(5.9-6.3)	(5.1-5.3)	(24.2-25.3)
Sex					
Male	124.7	83.1	6.9	5.2	26.5
	(124.1-125.2)	(82.8-83.5)	(6.7-7.0)	(5.2-5.3)	(26.4-26.7)
Female	121.8	81.1	6.0	5.1	26.7
	(121.1-122.6)	(80.6-81.6)	(5.8-6.1)	(5.1-5.2)	(26.4-27.0)
Race					
Malay	124.5	82.8	6.7	5.2	27.1
	(124.0-125.0)	(82.5-83.1)	(6.5-6.8)	(5.2-5.3)	(26.9-27.2)
Chinese	120.3	80.5	5.8	5.1	24.2
	(119.1-121.4)	(79.8-81.2)	(5.6-5.9)	(5.0-5.1)	(23.9-24.5)
Indian	122.5	82.0	6.8	5.1	26.7
	(121.1-123.9)	(81.1-82.9)	(6.5-7.2)	(5.0-5.2)	(26.3-27.2)

Table III: Frequency Distribution and Prevalence of Modifiable CVD Risk Factors by Socio-Demographic Characteristics

	Modifiable Risk Factors					
	HPT (%)	RBS >8 mmol/L (%)	TChol > 5.2 mmol/L (%)	BMI ≥ 25kg/m^2 (%)	Smoking *(%)	At least 1 RF (%)
Number with risk factor (%)	1286 (34.2)	615 (16.6)	1442 (40.2)	2342 (62.6)	1060 (29.4)	2945 (86.8)
Age (years)	**n=3765**	**n=3715**	**n=3589**	**n=3741**	**n=3600**	**n=3391**
30-39	98 (21.2)	46 (10.5)	126 (34.4)	265 (58.5)	69 (16.0)	263 (79.2)
40-49	771 (35.2)	375 (17.3)	866 (40.6)	1418 (68.1)	759 (36.4)	1790 (88.8)
50-59	320 (37.5)	163 (19.3)	337 (40.6)	546 (64.3)	188 (22.7)	690 (86.8)
60+	97 (37.0)	31 (11.9)	113 (43.6)	113 (43.3)	44 (17.3)	202 (81.5)
Sex	**n=3765**	**n=3715**	**n=3589**	**n=3741**	**n=3600**	**n=3391**
Male	882 (36.3)	489 (20.3)	975 (41.5)	1553 (64.1)	1077 (45.1)	2007 (91.7)
Female	404 (30.3)	126 (9.6)	467 (37.6)	789 (59.9)	33 (2.1)	938 (78.0)
Race	**n=3753**	**n=3703**	**n=3578**	**n=3730**	**n=3591**	**n=3383**
Malay	1009 (36)	489 (17.7)	1126 (42.4)	1865 (67)	920 (34.5)	2257 (90.1)
Chinese	144 (25.7)	41 (7.4)	184 (33.8)	210 (37.8)	80 (14.7)	370 (71.4)
Indian	130 (33.3)	83 (21.5)	127 (33.3)	258 (66.2)	57 (15.2)	314 (86.5)

n= number responding
*Excluding ex-smokers

Table IV: Crude Association between Modifiable Cardiovascular Disease Risk Factors and Non-modifiable CVD Risk Factors

	HPT cOR (95% CI)	T Chol cOR (95% CI)	RBS cOR (95% CI)	BMI cOR (95% CI)	Smoking cOR (95% CI)	At least 1 RF cOR (95% CI)
Age (years)						
30-39	Ref	Ref	Ref	Ref	Ref	Ref
40-49	2.0	1.3	1.8	1.3	3.0	2.1
	(1.6-2.6)	(1.0-1.7)	(1.3-2.5)	(1.1-1.6)	(2.3-3.9)	(1.6-2.8)
50-59	2.2	1.3	2.0	1.3	1.5	1.7
	(1.7-2.9)	(1.0-1.7)	(1.4-2.9)	(1.0-1.6)	(1.1-2.1)	(1.2-2.4)
60+	2.2	1.5	1.2	0.5	1.1	1.2
	(1.6-3.1)	(1.1-2.0)	(0.7-1.9)	(0.4-0.7)	(0.7-1.7)	(0.8-1.8)
Sex						
Male	1.3	1.2	2.4	1.2	38.9	3.1
	(1.1-1.5)	(1.0-1.4)	(1.9-2.9)	(1.0-1.4)	(26.4-57.5)	(2.6-3.8)
Female	Ref	Ref	Ref	Ref	Ref	Ref
Race						
Malay	1.6	1.4	2.7	3.3	3.1	3.6
	(1.3-2.-0)	(1.2-1.8)	(1.9-3.7)	(2.8-4.0)	(2.4-4.0)	(2.9-4.6)
Chinese	Ref	Ref	Ref	Ref	Ref	Ref
Indians	1.4	0.98	3.4	3.2	1.0	2.6
	(1.1-1.9)	(0.7-1.3)	(2.3-5.1)	(2.5-4.2)	(0.7-1.5)	(1.8-3.7)

cOR- Crude Odds Ratio
* Ref-Reference

Table V: Adjusted Association between Modifiable Cardiovascular Disease Risk Factors and Socio-demographic Characteristics

Age (years)	HPT aOR (95%CI)	TChol aOR (95% CI)	RBS aOR (95% CI)	BMI aOR (95% CI)	Smoking aOR (95% CI)	At least 1 RF aOR (95% CI)
30-39	Ref	Ref	Ref	Ref	1.3 (0.8-2.1)	Ref
40-49	1.9 (1.5-2.4)	1.2 (0.9-1.5)	1.4 (1.0-1.9)	1.3 (1.0-1.6)	1.7 (1.1-2.5)	1.4 (1.0-1.9)
50-59	2.2 (1.7-2.9)	1.4 (1.0-1.6)	1.8 (1.3-2.6)	1.4 (1.1-1.8)	1.0 (0.7-1.5)	1.5 (1.0-2.1)
60+	2.6 (1.8-3.7)	1.7 (1.2-2.4)	1.2 (0.8-2.1)	0.8 (0.6-1.1)	Ref	1.4 (0.9-2.2)
Sex						
Male	1.1 (1.0-1.3)	1.1 (0.9-1.2)	2.1 (1.7-2.6)	0.9 (0.8-1.1)	36.5 (24.4-54.6)	2.5 (2.0-3.1)
Female	Ref	Ref	Ref	Ref	Ref	Ref
Race						
Malay	1.7 (1.4-2.2)	1.5 (1.2-1.9)	2.1 (1.5-3.1)	3.2 (2.6-3.9)	2.2 (1.6-3.0)	2.8 (2.2-3.7)
Chinese	Ref	Ref	Ref	Ref	1.7 (1.1-2.5)	Ref
Indian	1.6 (1.2-2.2)	1.0 (0.8-1.3)	3.2 (2.1-4.8)	3.2 (2.5-4.3)	Ref	2.4 (1.7-3.4)

*aOR –adjusted odds ratio

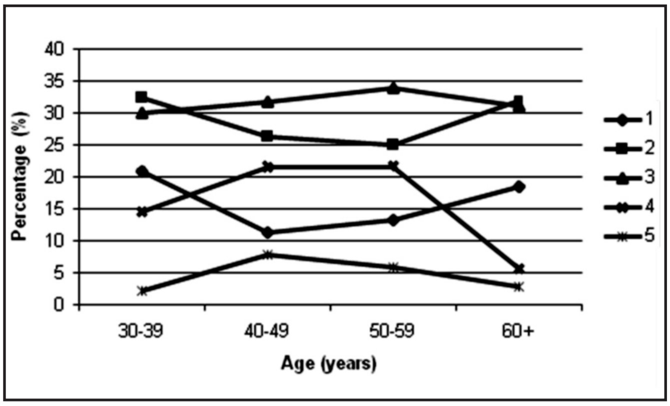

Fig. 1: Number of Risk Factors by Age

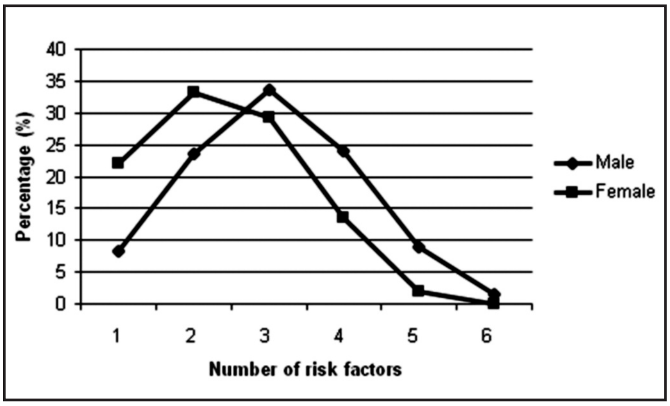

Fig. 2: Number of Risk Factors by Sex

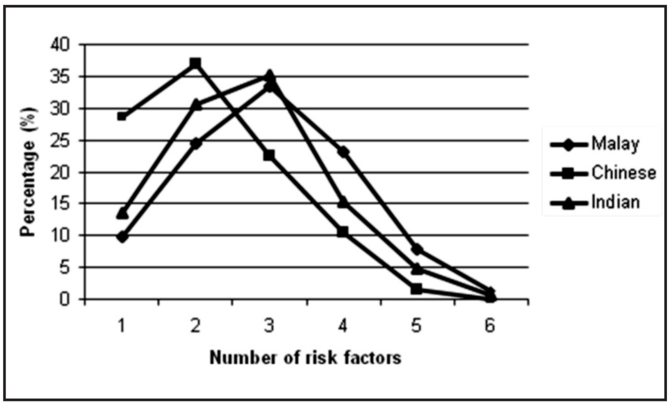

Fig. 3: Number of Risk Factors by Race

DISCUSSION

For the purpose of analytic (bivariate) statistics, ex-smokers were removed from the analysis as their numbers were small (3.1%) and studies have shown that after smokers give up smoking, their risk of mortality and future cardiac events declines and that the smoking associated inflammatory response subsides within 5 years after smoking cessation. This suggests that vascular effects are reversible and that cardiovascular risk subsides gradually with reduced exposure[8].

The majority of those screened were in the age group of 40-59 years, similar to the monitoring of CVD screening done in Seremban district, Negeri Sembilan[9]. Our study showed the highest prevalence of CVD risk factors being undesirable BMI readings followed by hypertension, while in Seremban the reverse was true. However, similar findings were found with regards to smoking and RBS[9].

The prevalence of both systolic and diastolic hypertension increased with age, similar to the trend noted in other studies in Britain and Seychelles[10,11]. The males in this study showed an increased risk for high blood pressure, which was in contrast to the rural black population of South Africa where the women had higher blood pressure levels[12]. An increasing prevalence of hypertension with increasing age appears to be a universal phenomenon and may be attributable to the aging process.

Reduction in blood pressure is central to the management of cardiovascular risk and provides a starting point for initiating a more comprehensive cardiovascular risk management strategy[13]. The possibility of reduced awareness of the risks of hypertension may exist among those screened. Therefore, any health education being conducted currently by the health centre staff may not be reaching the older age groups.

The mean values for BMI and total cholesterol in our study were similar to those in the Thailand study, where BMI was 24 kg/m² and total cholesterol was 5.2 mmol/L. In both studies, women had higher levels of BMI. However they differed in total cholesterol levels, which was higher in men in our study[14].

The prevalence of hypercholesterolaemia in our study was at least one and a half times higher than that in the NHMS III study and another population based study in Thailand[7,14]. Our study showed a positive association with increasing age, with the highest prevalence among the Malays. A study on cardiovascular risk factors in the developing world, however showed a lack of association between blood cholesterol and age. This difference could be attributable to other factors such as physical activity and dietary habits[15].

Of those screened for RBS, there was a steady increase with increasing age which declined after the age of 60. The males had twice the risk for elevated RBS as compared to females. Similar findings were seen in a study on a Native American tribe but there was no significant male-female differences observed[16]. Our study also showed that the risk was high among the Indians, similar to the study in Canada on ethnic South Asians where mean fasting glucose concentration was used[17].

Undesirable body mass index was seen in more than half of those screened, similar to that found in the ethnic Hawaiian study but differed from the Thailand study[14,18]. In our study, the ageing Malays had a higher BMI when compared to the Chinese.

With regards to smoking, similar findings were observed in the Thailand study where majority were also males and 25% currently smoked[14]. The risk of smoking in men was significantly more than in women and this was in sharp contrast to the British family heart study where there was hardly any difference between male and female current smokers[11].

Rather than existing in isolation, cardiovascular risk factors tend to occur in clusters. For example, in a study determining the prevalence of cardiovascular disease risk factors among 14,690 Chinese adults aged 35-74 years, 80.5%, 45.9% and 17.2% of the individuals had ≥1, ≥2 and ≥3 modifiable CVD risk factors respectively[19]. In our study the prevalence of having between 1 to 3 risk factors was slightly higher at 86.9%, 59.9% and 27.9% respectively. Similar findings were also observed among the Southwestern Native American tribes[16]. Using multivariate analysis, BMI was significantly associated with hypertension and elevated TChol. Similar findings were shown in a study in the developing world and among American Indians in Montana, although that study included all adults aged 18 and above[15, 20].

The relationship between cardiovascular risk factors is synergistic, meaning that when multiple risk factors are present in a specific individual, each one is more important than if they were present in isolation[21]. Several studies have shown that a progressively greater number of additional cardiovascular risk factors is associated with a correspondingly poorer clinical outcome[22].

In our ethnic based screening for risk factors, the middle aged Malay males appeared to have the highest cluster of risk factors consisting of undesirable cholesterol levels, hypertension and elevated BMI. The Indians only showed higher random blood glucose levels.

Identification of those at high risk would then enable treatment to be given aggressively to avoid or reduce the risk of a cardiovascular event. Health promotion activities should be targeted at this group of the population.

Global risk assessment strategies have a number of benefits[23]. A major benefit is that they raise awareness that a risk is continuous and graded and that it is related to the overall burden of risk. They also facilitate adjustment taking into account the severity of the individual component risk factor. Furthermore, they emphasise that a more individualized treatment approach is required and reiterate that the clinician must not focus on one specific risk factor when multiple cardiovascular risk factors are present concomitantly[23].

The current levels of risk factors gathered could be expanded as many factors that convey an increased risk were not part of the screening process such abdominal obesity (metabolic syndrome), low / high density lipoprotein (HDL), proteinuria, family history, exercise habits and psychosocial factors. A further screening study including the above may have to be implemented to reflect the overall cluster risk and enable strategic preventive planning. This study could be utilized as a baseline to measure trends over time and assess the outcomes of future interventions taken. The additional data obtained from the added risk factors should also enable clinicians to formulate a multifactoral approach to treatment and thus reduce cardiovascular events.

One of the limitations in this study was that random blood sugar measurements were taken instead of a fasting blood sugar level. The latter would have provided a more accurate assessment. Another limitation is the absence of follow up and monitoring data in the screening process, which would have shown whether the screening program had made an impact to the health status and health outcomes of these patients. The absence of follow up and monitoring defeats the ultimate purpose of screening. Although this study was a preliminary one and the number of patients screened was not so encouraging, the findings from the study imply there is merit for a more aggressive and comprehensive CVD risk factor screening program of a larger population. It is recommended that similar studies be conducted at other health centres. This would enable stakeholders to assess the CVD health status of the local population, as well as compare with other health centres and plan for effective intervention programs.

CONCLUSION

This study showed a significantly high prevalence of risk factors for CVD in the adult patients screened. The prevalence of all risk factors was highest among middle aged males with Malays having the highest percentage except for elevated RBS which was highest among the Indians. The prevalence of having at least two risk factors was 60%, those in the 40-49 age group having the highest percentage for all 5 risk factors combined. Modifying these risk factors could substantially reduce the incidence of premature cardiovascular disease. The findings clearly show a vital need for health promotion interventions that target CVD and their risk factors.

Health educating the population will require a multipronged approach directed not only to high risk populations but also to communities, schools, worksites and the food industry. Health care practitioners could promote healthy lifestyle through encouragement to engage in physical activity, healthy food choices and abstinence from tobacco.

Partnerships with community groups and local leaders including village heads would provide locally focused orientation to the health needs of our diverse population. For any interventional strategy to be successful, it should address the diversity of racial, ethnic, cultural, religious and social factors in its planning and implementation.

Traditionally, health care physicians tend to deal with each CVD risk factors as a distinct entity much unrelated to other risk factors. Awareness of these risk factors must be at the forefront of thinking in physicians who see patients at the primary health care centres. With the availability of these screening services, modifiable risk factors for CVD can be detected early and advice on lifestyle and dietary changes with medical treatment when required can be instituted to reduce the occurrence of CVD. Appropriate follow up and referral to the physician of those identified with risk factors is necessary to reduce the risk of ischemic events thereby reducing morbidity and associated mortality.

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