

# Ethnic characteristics of coronary heart disease risk factors and mortality in peninsular Malaysia

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The types and prevalence of coronary heart disease (CHD) risk factors vary somewhat among the three main ethnic groups in peninsular Malaysia. Indians consistently show the highest prevalence for hypercholesterolemia and diabetes mellitus. Among the Malays, a relatively high prevalence of hypertension and hypertriglyceridemia have been reported. Overweight is also a risk factor among the Indians and Malays. In general, Chinese tend to have a lower prevalence for these CHD risk factors than the Indians and Malays. Parallel to the rapid socio-economic development and urbanization in recent decades is a rise in the percentage of deaths due to cardiovascular disease in peninsular Malaysia, that is from 1.8% of total deaths from all causes in 1950 to about 30% in 1991. Coronary heart disease accounts for 40% of all cardiovascular diseases. The mortality rate for CHD has more than doubled between 1965 and 1991, from 24.6 per 100 000 to 57.2. While Indians have been showing the highest CHD mortality rate so far, that of the Malays has been increasing most rapidly since 1970, concomitant with the latter's increase in their proportion of the urban population in peninsular Malaysia.

## Introduction

Among the early clinical reports on coronary heart disease (CHD) in Malaysia was Pallister's<sup>25</sup> description of 89 cases in the Penang General Hospital between 1952 and 1955. He observed that coronary artery disease was more common among Indians than Chinese. There were too few Malay patients for comparison. At the same hospital between 1958 and 1960, Khaira<sup>14</sup> reported that out of 500 cases of cardiovascular diseases, hypertensive heart disease (diastolic pressure >95 mmHg; 38.8%) and CHD (20.4%) formed the major types. The author observed that the incidence of CHD among Penang heart patients was high compared to the pattern of heart disease in western countries. The patients were from various ethnic and economic groups.

In contrast, the incidence of CHD was reported low (2.5%) among 10 000 subjects who attended a private general practice in a medium-sized town between 1963 and 1965<sup>1</sup>. This report found hypertension (diastolic pressure >100 mmHg), rheumatic heart disease and congenital heart disease to be the major cardiovascular diseases accounting for 84% of the total. The frequency of hypertension was reportedly higher among the Malays and Indians than the Chinese when compared to their ethnic distributions in the population. Documentation of CHD experiences in hospitals increased with the setting up of Coronary Care Units in several public hospitals<sup>8,23</sup>.

## CHD risk factors among the ethnic groups

Since the Framingham Heart Study in 1948, numerous exper-

imental and epidemiologic studies in various countries have been undertaken. Several risk factors related to the development of CHD have been identified and these include a high level of fat consumption, high serum cholesterol, glucose intolerance, high blood pressure, cigarette smoking and obesity<sup>9,22</sup>.

Studies on the prevalence of CHD risk factors among Malaysians have been on the rise since the early 1960s. Chong<sup>5</sup> and Lau et al.<sup>19</sup> were among the earliest to present serum cholesterol values of apparently healthy males of Malay, Chinese and Indian origin. The former study involved a small number of subjects (84) and the mean serum cholesterol levels for the three ethnic groups were between 180–196 mg/dl. Likewise Lau et al.<sup>19</sup> found the three ethnic groups (512 subjects) had a low mean serum cholesterol value of 171 mg/dl. Their serum cholesterol levels showed a peak in the 30–39 age group and a flattening out in the 40–49 age group indicating an earlier peak than in western countries.

The Malaysian aborigine males possess an even lower serum cholesterol level than the other ethnic groups, and this factor plus a physically active life and a diet consisting largely of unrefined carbohydrate were suggested to attribute to an absence of CHD among the aborigines<sup>2</sup>.

Nonetheless, subsequent studies in the 1970s and 1980s indicated that the mean serum cholesterol levels among Malaysian males appeared to be higher than the levels reported during the 1960s. In the study by Chong and Khoo<sup>6</sup> involving a total of 1,025 subjects, the mean serum cholesterol ranged from 203–237 mg/dl, 197–232 mg/dl and 192–217 mg/dl for Malay, Chinese and Indian men respectively. Teo et al.<sup>31</sup> in a study in 1982–1985, showed that the

average serum cholesterol level for 406 urban male executives exceeded 200 mg/dl, being highest for the Indian subjects (mean 247 mg/dl) followed by the Malays (236 mg/dl) and Chinese (227 mg/dl). This study also included other risk factors and it found the Malay male subjects had the highest prevalence for hypertension (diastolic pressure  $\geq$  95 mmHg), overweight (BMI > 30) and elevated triglycerides (> 190 mg/dl). Hypercholesterolemia (> 250 mg/dl) was most prevalent among the Indian respondents while the Chinese were in between the Malays and Indians for all these risk factors.

The CHD risk factors among Malays in both community and hospital settings became the subject of a number of studies in the 1980s. In a retrospective study of 116 Malay patients suffering from acute myocardial infarction in the Coronary Care Unit of the Kuala Lumpur General Hospital, Ridzwan Bakar et al.<sup>30</sup> reported that almost all of them had at least one CHD risk factor, namely smoking (> 10 cigarettes daily; 74%), hypertension (> 169/90 mmHg; 44%), diabetes mellitus (20%) and a family history of CHD (9%). A high prevalence of hypertensives was also found among rural Malay adults<sup>24</sup>. Out of 359 people examined, 26% had hypertension (systolic pressure > 140 mmHg and diastolic pressure > 90 mmHg).

Apparently the prevalence of hypertensives in the urban areas in peninsular Malaysia does not differ significantly from that in the rural areas, although the former has a somewhat higher prevalence. In a study by Kandiah et al.<sup>11</sup> of 963 respondents, 14% were found hypertensive and of these, 16.8% were from the urban areas and 12.3% from rural areas. Ethnicity-wise, this study reported that the Malays had the highest prevalence (14.7%) followed by Chinese (14.5%) and Indians (10.8). In addition, there were significantly more hypertensives among smokers than non-smokers.

Cigarette smoking has been shown to be the single most prevalent risk factor of CHD among patients in the Coronary Care Unit of Kuala Lumpur General Hospital<sup>27</sup>. Out of 311 patients admitted between August 1986 and January 1987 and confirmed to have acute myocardial infarctions, 61.1% were smokers (> 20 cigarettes daily) compared with 41.8% among the non-coronary patients, the difference being statistically significant ( $P < 0.001$ ). A high prevalence of smoking was found among the patients from all three ethnic groups that is, 73.7%, 80.3% and 71.4% of the Malay, Chinese and Indian patients respectively.

Although relatively fewer Malaysian women smoke as a habit compared to men, those who do bear a significant risk of getting either an acute myocardial infarction or a non-infarct coronary event. In a prospective case-control study over a two-year period involving 1,006 women coronary patients, Quek et al.<sup>28</sup> reported that cigarette smoking (> 20 cigarettes daily) increased the relative risk estimates for acute myocardial infarction between 1.8 to 3.4 times for the various ethnic groups compared to non-smoking women. The strongest association was observed among Chinese women where the odds ratio was 3.4. Probably due to the smaller number of smokers among Malay and Indian women in this study, their odds ratios did not reach significant levels.

Diabetes for which the predominant cause of death is heart disease, is reported to be on the rise in Malaysia<sup>17</sup>. Among the Malays, the prevalence of diabetics is lower in the rural (2.8%) than in the urban area (8.2%)<sup>3</sup>. It is more prevalent in Indians (16%) than in Chinese (4.9%) and Malays (3%) as shown by a study involving 2000 railway workers<sup>15</sup>. The particularly high prevalence of diabetes among the Indians in

Malaysia reflects similar findings in Singapore and elsewhere<sup>4</sup>. It is hypothesized that Indians have a genetic predisposition to diabetes but more studies are needed in order to verify this suggestion.

Overweight is another important risk factor known to be positively associated with elevated blood pressure, blood lipids and blood glucose<sup>7,9,12</sup>. There are relatively few studies on obesity among Malaysians. Moreover, the cut-off points for body mass index (BMI) to define overweight vary among the studies making comparison difficult. Jones's study<sup>10</sup> of 300 men and 300 women from Kuala Lumpur found the prevalence of overweight to be highest among Malay men (BMI > 21.5; 44%) and among Indian women (BMI > 20.5; 50%) in the 31–40 age group. In the older age group of 41–50, the situation is reversed with the highest percent of Indian men (27%) and Malay women (33%) who were overweight. The prevalence of overweight among Chinese men and women was relatively much lower, being 4% and 7% respectively in the 31–40 age group and 20% for both genders in the older age category. A more recent study by Teo et al.<sup>31</sup> showed that the difference in the prevalence of overweight between Malay and Chinese men aged 25–54 from Kuala Lumpur was significant. Approximately 37% of the Malays were overweight (BMI = 25–30), compared to 21% among the Chinese. The prevalence of overweight among the Indian subjects was also high at 32%.

#### Trends in coronary heart disease mortality

The annual publication on Vital Statistics for peninsular Malaysia by the Department of Statistics of Malaysia<sup>20</sup> is the primary source of data for this section. Sabah and Sarawak are not included as comparable data for the periods considered are not available for these two states in East Malaysia. A significant limitation of the data from the Vital Statistics is that it currently covers only 40% of all mortality cases, that is, those which are medically certified and inspected.

Since the early 1970s, cardiovascular diseases have been the leading cause of mortality in Malaysia among medically certified and inspected cases. Deaths due to cardiovascular

Table 1. The leading causes of medically certified and inspected deaths in peninsular Malaysia.

	1991			1970
	Number of cases	% of total deaths	Rank	Rank
Diseases of the circulatory system	8540	29.7	1	3
Accidents, poisoning and violence	4352	15.1	2	4
Neoplasms	3423	11.9	3	6
Symptoms of ill-defined and unknown causes	1945	6.8	4	2
Certain conditions originating in the perinatal period	1791	6.2	5	1
Infections and Parasitic Diseases	1570	5.5	6	5
Diseases of the respiratory system	1010	3.5	7	7
Diseases of the genitourinary system	937	3.3	8	10
Congenital anomalies	897	3.1	9	9
Endocrine, nutritional and metabolic diseases and immunity disorders	723	2.5	10	–

Total death cases in 1991 = 28 757

Table 2. Mortality\* due to cardiovascular diseases and coronary heart disease.

Year	Percentage of all causes of death		Coronary heart disease as percentage of all cardiovascular diseases
	Cardiovascular diseases	Coronary heart disease	
1991	29.7	11.9	40.2
1990	28.7	11.4	39.2
1989	29.6	11.3	38.2
1988	29.9	11.7	39.2
1987	28.3	11.1	39.0
1986	28.6	11.1	38.7
1985	28.5	10.4	36.3
1980	22.6	8.1	35.9
1975	20.0	5.9	29.5
1970	11.1	4.7	42.3
1965	9.2	3.0	32.7

\* For medically certified and inspected cases only.

Table 3. Mortality rates for cardiovascular diseases and coronary heart disease.

Year	Cardiovascular diseases	Coronary heart disease
	(per 100 000 population)	
1991	57.2	23.0
1990	55.4	22.0
1989	55.2	21.1
1988	55.4	21.7
1987	50.9	19.9
1986	55.6	21.5
1985	54.8	20.8
1980	47.5	17.0
1975	46.7	13.8
1970	26.1	11.0
1965	24.6	8.0

\* For medically certified and inspected cases only.

diseases spiralled from 1.8% of total deaths from all causes in 1950 to 20% in 1975, and is currently at about 30%. This level exceeds the combined total deaths from accidents and neoplasms, which are the second and third major causes of mortality respectively (Table 1). Coronary heart disease has emerged as the single most important cardiovascular disease. The proportion of CHD deaths out of total mortality cases rose from 3% in 1965 to 11.9% in 1991 (Table 2). CHD accounts for 40% of all cardiovascular diseases having risen, albeit gradually from 32.7% in 1965. During this period, mortality due to other forms of cardiovascular diseases have been on the decline, for example cerebrovascular disease

from 33% in 1975 to 28% in 1991; rheumatic heart disease from 4.4% in 1965 to 1.6% in 1991; and hypertensive diseases from 16.8% in 1965 to 1.4% in 1991<sup>11,12</sup>. The total number of CHD mortality has risen by about 3.5 times between 1970 and 1990 from 968 cases to 3212. The increase could indicate improved diagnosis and reporting of CHD cases in peninsular Malaysia.

The rapid emergence of cardiovascular diseases and CHD specifically as causes of death is clearly evident in terms of mortality rates as shown in Table 3. The mortality rate for cardiovascular diseases increased by 2.3 times between 1965 and 1991, that is from 24.6 to 57.2 per 100 000. Meanwhile the CHD mortality rate almost tripled from 8.0 to 23.0 over the same period.

#### Ethnic differentials in CHD mortality

Two decades ago the Chinese had the highest proportion of CHD mortality compared with Malays and Indians. They accounted for 43.8% of the total cases while the percentages for Malays and Indians were 20.8% and 31.1% respectively in 1970 (Table 4). The Chinese proportion has been on a decline with the concomitant increase in the Malay proportion, which has surged to 38.2% in 1990, the highest level among the three ethnic groups. This increase for the Malays may be due in part to the rapid rise in the proportion of Malays in the urban population especially since 1970. The Malay urban population rose 27.6% between 1970-90. In this way increased Malay deaths due to CHD could be included among the medically inspected and certified cases, as such cases tend to reflect more the urban areas.

Another point of significance shown by Table 4 is the relatively high proportion of CHD mortality for the Indians. Their share of the CHD mortality in 1990 at 23.2% exceeded more than fourfold their representation of 5.5% in the population in peninsular Malaysia. In comparison, the Chinese who constitute about 31.1% of the population are represented by 37.8% in the CHD mortality. As for the Malays, despite the recent surge in CHD deaths, their proportion of total CHD mortality at 38.2% in 1990 remains below their representation in the country population of 58.5%.

In terms of mortality rates, the highest mortality rate is shown by Indians (51.8 per 100 000 in 1990) followed by Chinese (26.5) and Malays (14.4) (Table 5). Thus, Indians have a CHD mortality risk which is twice that for Chinese and 3.6 times higher than that for Malays. Nevertheless, in the past two decades, Malay CHD mortality rate has increased at the fastest pace that is, by 3.4 times compared to

Table 4. Distribution of coronary heart disease mortality by ethnicity.

Year	Malay		Chinese		Indian		*Total
	Subtotal	% of total	Subtotal	% of total	Subtotal	% of total	
1990	1226	38.2	1213	37.8	744	23.2	3212
1989	1125	37.4	1157	38.4	707	23.5	3011
1988	1080	35.6	1194	39.4	732	24.1	3034
1987	927	34.2	1066	39.3	695	25.6	2713
1986	918	32.0	1152	40.2	769	26.8	2867
1985	857	31.8	1101	40.8	714	26.5	2699
1980	529	27.1	826	42.4	567	29.1	1950
1975	405	29.4	538	39.0	415	30.1	1380
1970	201	20.8	424	43.8	301	31.0	968

\* Total includes Malay, Chinese, Indian and minority groups: the latter are not shown here.

Table 5. Mortality rates of coronary heart disease by ethnicity (per 100 000).

Year	Malay	Chinese	Indian	Total
1990	14.4	26.5	51.8	20.2
1989	13.6	25.6	50.1	21.1
1988	13.4	26.9	52.8	21.7
1987	11.8	24.4	51.0	19.9
1986	12.0	26.3	57.6	21.2
1985	11.7	26.0	54.7	20.8
1980	8.6	22.6	48.4	17.0
1975	7.6	15.3	39.2	13.8
1970	4.2	12.1	28.0	10.2

2.2 and 1.9 times for Chinese and Indians respectively during the same period.

The CHD mortality rate for Malaysian men is twice as high as that for women. In 1990 the rate was 27.2 per 100 000 for men compared to 13.6 for women (Table 6). Ethnicity-wise, the gender differential is highest for Malays, that is 2.7 times more Malay men than Malay women succumbed to CHD in 1990. This is followed by 2.4 times for Indians and 1.6 times for Chinese. The gender differential for all ethnic groups used to be bigger. For example in 1975, 4.1 times more Malay men died of CHD than Malay women. Similarly for Chinese and Indians, the difference was 2.3 times and 5.3 times respectively in 1975. The more rapid increase in CHD mortality rate for Malaysian women could indicate in part that increasingly more CHD cases among women are being diagnosed, reflective of more women living in urban areas, and also to their increased awareness for health and medical care.

The CHD mortality rates for Malaysian men and women are shown in Table 7 according to two age categories namely, 35–49 years old and 50+ age group. The mortality rates for both men and women in the older age group are substantially higher when compared to their younger counterparts. In 1990, older men had a mortality rate of 215.2 per 100 000 which is 8.6 times more than that for men in the 35–49 age group. The difference is much bigger among women, being

19 times higher for the 50+ age group than the younger group. Coronary heart disease is known to afflict more frequently those in the middle-age and older categories. Among women, increased CHD risk rises rapidly after menopause due to lack of protection from oestrogen.

The gap in CHD mortality rate between the older and younger age groups used to be smaller. For example, in 1975 the mortality rates for men and women over 50 years were only 4.6 and 8 times respectively higher than their counterparts in the 35–49 age group (compared to 8.6 and 19 times in 1990). Khoo et al.<sup>16</sup> reported that the frequency distribution of CHD mortality in peninsular Malaysia showed its mode at 60–64 years of age for men and at 65–69 years of age for women in 1989. They noted that the mode of distribution has shifted from 55–59 years for both men and women in 1970, and they suggested that the shift to older ages reflect an improved general health and ageing population.

### Discussion

The present review of past studies and mortality data showed some distinctive ethnic characteristics related to the prevalence of coronary heart disease risk factors and mortality in peninsular Malaysia over almost the last three decades. The proportion of deaths due to cardiovascular diseases has multiplied more than three-fold since 1965. This increase in relation to other diseases such as infectious and parasitic diseases reflects improved socio-economic status which the country has been experiencing almost unabated since attaining Independence in 1957. The life expectancy at birth has risen from 56 years in 1955 to 69 years in 1991 for men, and from 58 years to 73 years for women during the same period. As people live longer, degenerative diseases including cardiovascular diseases become more evident. Among the cardiovascular diseases, CHD has assumed increasing importance as its major cause of mortality.

The CHD mortality rate for Malaysian Indians is consistently higher than that for Malays and Chinese. Clinical

Table 6. Mortality rates of coronary heart disease by ethnicity and gender (per 100 000).

Year	Total		Malay		Chinese		Indian	
	Male	Female	Male	Female	Male	Female	Male	Female
1990	27.2	13.6	20.9	7.9	32.2	20.7	72.8	30.2
1989	27.9	14.2	19.5	7.7	29.5	21.8	70.9	28.6
1988	29.8	13.5	19.6	7.2	32.7	21.0	78.2	26.5
1987	27.4	12.3	17.0	6.8	30.7	18.0	75.2	26.0
1986	29.5	12.8	18.1	6.1	33.1	20.2	85.6	28.6
1985	29.7	11.9	18.2	5.2	32.4	19.4	82.9	25.2
1980	24.8	9.2	13.7	5.1	27.0	15.6	80.0	20.1
1975	21.1	6.1	12.0	2.9	21.0	9.2	63.9	12.1

Table 7. Mortality rates of coronary heart disease by gender and age groups (per 100,000).

	Male				Female			
	35–49		50+		35–49		50+	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
1990	279	25.1	1861	215.2	60	5.4	959	102.7
1989	266	24.6	1696	204.8	63	5.8	937	104.6
1988	264	25.3	1577	196.3	57	5.5	870	100.2
1987	267	26.3	1573	203.3	66	6.6	762	91.2
1986	294	30.1	1679	224.0	71	7.4	769	95.1
1985	300	31.5	1592	219.7	58	6.3	684	87.8
1980	219	29.4	1171	189.6	45	6.1	464	72.4
1975	207	32.2	824	149.0	37	5.6	262	47.3

reports also have shown that the incidence of CHD is highest among Indians<sup>25,27</sup>. They are over-represented among the acute myocardial infarction patients compared to their proportion in the country population. The prevalence of hypercholesterolemia is highest among Indians<sup>31</sup>. Similar findings have also been reported for Indians in Singapore, the United Kingdom and elsewhere<sup>21</sup>. It is hypothesized that Indians have a genetic predisposition to CHD and factors like obesity and stress can unmask the genetic predisposition<sup>16</sup>.

Urbanization in Malaysia has resulted in an increase in the Malay proportion of the urban population, being 'pulled' largely by better economic opportunities in the urban areas<sup>18</sup>. Parallel to the fast pace of urbanization is a rapid rise in the CHD mortality rate with Malays showing the most rapid increase. Between 1970 and 1991 the Malay CHD mortality rate rose by 3.4 times compared to 2.2 and 1.9 times for the Chinese and Indians respectively. Reflecting the rising trend in CHD mortality are findings of urban Malays in the 1980s having a high prevalence of CHD risk factors particularly hypertension, overweight and hypertriglyceridemia<sup>30,31</sup>.

It is shown that habitual smoking corresponded with increased acute myocardial infarction risk among Malaysian men and women<sup>24,28</sup>. Cigarette smoking is known to be a strong predictive factor of cardiovascular disease in adults<sup>13</sup>. Unfortunately, habitual cigarette smoking among Malaysians is not well documented. Teo et al.<sup>31</sup> reported a smoking prevalence of between 21%–26% among urban male executives of different ethnicities. Pathmanathan<sup>26</sup> showed that in a rural Malay community, 34% of adults were smokers with a male–female ratio of 2:1. The prevalence of Malaysian women smokers is relatively small, estimated at below 15%<sup>28</sup>.

Among the known risk factors of CHD, certain determinants like family history of premature CHD, age and menopause are unavoidable, but others such as cigarette smoking, diabetes, hypercholesterolemia, overweight, hypertension and stress are amendable to behavioural modifications. The risks of CHD should be part of a continuous health education promoted through public health campaigns, screening for CHD risk factors and dietary counselling.

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**Ethnic characteristics of coronary heart disease risk factors and mortality in peninsular Malaysia**

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*Asia Pacific Journal of Clinical Nutrition 1994; 3: 93-98***馬來西亞半島冠心病危險因素的民族特點****摘要**

馬來西亞半島三種主要民族冠心病危險因子的發病率和類型稍有不同。印度人患糖尿病和高膽固醇血症最高。馬來人患高血壓和高甘油三酯血症較高。超重也是印度人和馬來人的危險因子，一般來說，中國人得冠心病危險因子比印度人和馬來人低。近年來，與城市化和社會經濟的迅速發展相平衡，馬來西亞半島由於心血管疾病致死的百分率有所增加，從 1950 總死亡率 1.8% 約上升到 1991 年的 30%。冠心病估計佔心血管疾病 40%。從 1965—1991 年，心血管疾病死亡率增加超過 2 倍，從每十萬人 24.6 上升至 57.2。與此同時，印度人有最高的冠心病死亡率。隨著最近馬來西亞半島城市居民比例的增長，自 1970 年以來，馬來人冠心病死亡率增加最快。

Jenis dan prevalen faktor risiko bagi penyakit jantung koronari (CHD) agak berbeza di antara tiga kumpulan kaum utama di Semenanjung Malaysia. Kaum India sentiasa menunjukkan prevalen yang paling tinggi bagi hiperkolesterolemia dan penyakit kencing manis. Bagi kaum Melayu prevalen tinggi secara relatif untuk hipertensi dan hiperlipidemia pernah dilaporkan. Faktor lebih berat badan juga merupakan faktor risiko CHD bagi kaum India dan Melayu. Pada amnya, kaum Cina mempunyai prevalen lebih rendah bagi semua faktor risiko tersebut berbanding dengan kaum India dan Melayu. Selaras dengan pembangunan sosio-ekonomi dan urbanisasi yang pesat pada dekad-dekad baru ini menunjukkan pertambahan peratus kematian yang disebabkan oleh penyakit kardiovaskular iaitu daripada 1.8% bagi semua sebab kematian pada 1950 kepada 30% pada 1991. Penyakit jantung koronari pula telah menyebabkan 40% kejadian penyakit kardiovaskular. Kadar kematian CHD telah meningkat dua kali ganda pada tempoh 1965-1991, iaitu daripada 24.6 per 100 000 kepada 57.2. Kaum India mempunyai kadar kematian CHD yang paling tinggi setakat ini, tetapi untuk kaum Melayu pula, kadar ini telah meningkat dengan cepat sejak 1970, selaras dengan pertambahan proporsi kaum Melayu dalam populasi di sektor bandar.