Ten-year cardiovascular risk in the general public of Hong Kong

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ABSTRACT

Background Coronary heart disease (CHD) is a major health issue in Hong Kong and has become the second leading cause of death since the 1960s. The prevalence of CHD and its mortality in Hong Kong are approaching a level that requires focused attention. Unfortunately, CHD could be a silent disease until the manifestations occur. Early detection and control of cardiovascular risk factors including cholesterol and blood pressure are vital.

Objective The current project aimed to investigate the 10-year cardiovascular risk in the general public of Hong Kong.

Design A 12-month prospective cross-sectional study.

Setting and patients General public of Hong Kong between April 2007 and April 2008.

Intervention Public screening of lipid panels and blood pressure.

Main outcome measurement Estimation of 10-year cardiovascular risk.

Results During this period, a total of 2607 patients were recruited with a mean age of 46.4±11.1 years (51.3% male), and 8.1% of subjects were active smokers. Among all of the subjects, the mean total cholesterol was 5.42±1.28 mmol/l, and the mean high density cholesterol was 1.59±0.75 mmol/l. The mean systolic blood pressure was 121.7±19.5 mm Hg. The assessment of the 10-year cardiovascular risk showed that 13.8% of the subjects were moderately high to high-risk patients.

Conclusion The general public in Hong Kong had a relatively high total cholesterol and normal-high systolic blood pressure. Almost two in every 10 Hong Kong citizens may have a 10—20% or more than 20% risk of developing CHD in the next 10 years.

INTRODUCTION

Coronary heart disease (CHD) is the leading cause of death in many western developed countries. In America, CHD accounted for 52% of total mortality caused by cardiovascular disease.[1] Similar to other developed countries, in Hong Kong heart disease is the second leading cause of death (15.9%).[2] CHD has been the dominating component, contributing to 69.4% of heart-disease-related deaths.[2] Moreover, the prevalence of CHD is growing among young people. An ageing population with multiple comorbidities and increased life expectancy would be one of the causes of the increasing trend. Among older people over 70 years of age, the prevalence of probable ischaemic heart disease was 7% for women and 6% for men, while the figures for possible cardiovascular disease were 25% and 23% respectively.[3]

Various changes in lifestyle among Hong Kong people would account for the upward trend in prevalence of CHD. According to Oxford Health Alliance, smoking, an unbalanced diet and a lack of exercise are the three main risk factors predisposing to chronic disease including cardiovascular disease.[4] Adoption of a western diet and fast-food culture are associated with obesity and metabolic syndrome, in both adults and adolescents. Physical inactivity makes the problem even worse.[5] Woo *et al* demonstrated that stroke and heart disease mortality had a negative association with participation in physical activity.[6]

The Framingham risk scoring assessment required few clinical measurements and was convenient to use. It would be more feasible to collect information necessary for the risk-level calculation. It is an excellent tool to alert people about their individual cardiovascular risk and to initiate primary prevention measures of CHD at an earlier stage. Framingham risk scoring can be adopted to assess the absolute risk and to guide clinicians on risk assessment to provide appropriate interventions and drug treatments.[7] Therefore, the objective of this study was to estimate the 10-year risk of CHD among Hong Kong people.

METHODS

A 12-month prospective cross-sectional public screening of lipid panels including total cholesterol and high-density cholesterol and blood pressure for the estimation of 10-year cardiovascular risk scoring using the Framingham CHD risk assessment was conducted on the general public of Hong Kong between April 2007 and April 2008. The study was promoted via chain community pharmacies in Hong Kong via radio, newspaper and in-store flyers. A total of 58 chain pharmacies participated in this project, which covered the 18 districts in Hong Kong. Citizens who were interested to join this study then visited one of the chain pharmacy stores to receive a coupon for the lipid panel and blood-pressure measurement. The investigators were unaware of the subjects who participated in the study. Therefore, the investigator selection bias should be minimal. Blood was drawn for lipid panels and blood-pressure measurements in a designated private laboratory that was unaware of the current study. The patients were advised to fast at least 12 h prior to the blood test. Blood pressure was measured by the laboratory technicians at the designated private laboratory where they use the electronic blood pressure monitor Omron HEM-7011 (Omron Healthcare, Kyoto, Japan). This device was deemed to be equivalent to Omron 7051T, which achieved an 'A/A' performance classification under the British Hypertension Society criteria and passed the Association for the Advancement of medical

Table 1 Sample demographics (n=2607)

Characteristic	Value
Age	46.40±11.15
Male	1338 (51.32)
Total cholesterol (mmol/l)	5.42±1.28
High-density lipoprotein cholesterol (mmol/l)	1.59±0.75
Systolic blood pressure (mm Hg)	121.68±19.48
Smoker	210 (8.06)
On antihypertensive medication	455 (17.45)
10-year risk level	
High (>20%)	83 (3.18)
Intermediate (10–20%)	276 (10.59)
Low (<10%)	2248 (86.23)

Instrumentation requirements. Data were collected by community pharmacists and the online website (http://www.10YearHeartRisk.com). Community pharmacists interviewed their customers and collected the clinical measurements of their blood cholesterol for calculating their 10-year risk scorings.

After the visit to the pharmacy and the private laboratory, subjects have the choice of either entering their information via the website or allowing the pharmacists to record and estimate their 10-year heart risk in person. If the subjects preferred to use the online website, the risk calculator was very simple to use. They just needed to input the related information into the online risk calculator in order to determine their 10-year CV risk.

Subjects must have completed all the items required for calculation of risk scores, had to be 18 years of age or older and had to have agreed to the consent in providing data for research purposes. They were excluded if they had a previous history of CHD, refused to disclose their data for research purposes or failed to provide sufficient data for calculation.

Risk-assessment calculation for determining the 10-year risk for developing CHD was performed by Framingham risk scoring published in the Third Report of the National Cholesterol Education Program Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III).[8] The 10-year risk for myocardial infarction and mortality due to CHD was estimated by summing the corresponding points of the individual risk factors.

RESULTS

A total of 2868 subjects were screened, and 2607 (91%) subjects were included in the analysis because the 261 subjects refused to reveal their data. The mean age was 46.4±11.1 years (range 20 to 87). The demographic data are listed in table 1. A summary of the flow of screening is provided in figure 1.

The mean values of total cholesterol and high-density lipoprotein (HDL) cholesterol were 5.4 mmol/l and 1.6 mmol/l respectively. The mean value of total cholesterol fell into the borderline high category (5.2 to 6.2 mmol/l) while HDL cholesterol could not reach the desirable level (≥1.6 mmol/l). The mean value of systolic blood pressure was 121.68 mm Hg, which fell into the stage of prehypertension according to the classification of JNC 7 Report.[9] The Framingham 10-year risk level was classified in three categories: high (with a risk of >20%), intermediate (with a risk of 10–20%) and low (with a risk of <10%). The percentages of samples with a 10-year risk classified as high, intermediate and low categories were 3.2%, 10.6% and 86.2% respectively. The mean 10-year risk was 5.22%±5.27 (95% CI 4.97 to 5.46).

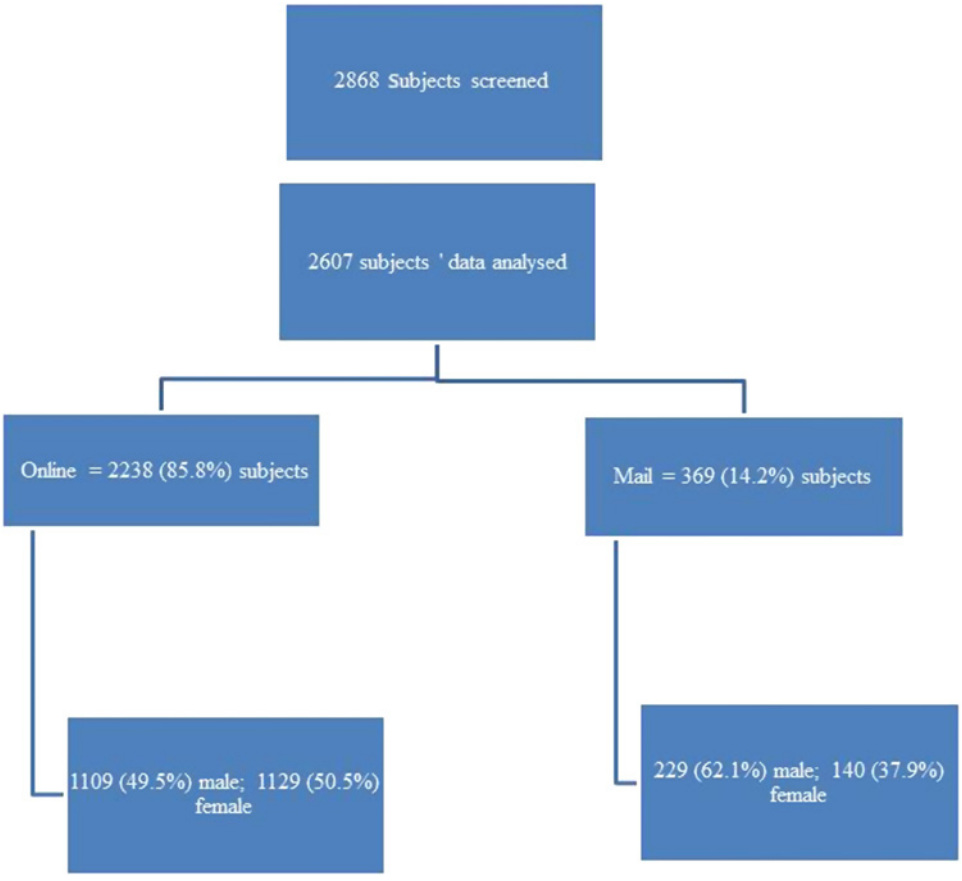

Figure 1 Summary of the flow of screening.

Table 2 Mean value of total cholesterol, high-density lipoprotein and systolic blood pressure in different age groups

Age group	Mean age	Mean total cholesterol (mmol/l)	Mean high-density lipoprotein (mmol/l)	Mean systolic blood pressure (mm Hg)	Total no of samples
20–30	25.77±3.13	4.85±1.69	1.51±0.89	117.28±27.29	255
31–40	36.13±2.86	5.33±1.18	1.53±0.73	119.13±17.72	445
41–50	45.59±2.79	5.51±1.24	1.63±0.79	121.02±18.90	977
51–60	55.06±2.77	5.59±1.24	1.62±0.66	123.38±16.55	721
61–70	65.02±2.97	5.25±1.19	1.44±0.61	127.98±17.64	169
≥71	74.40±2.57	5.03±1.91	1.72±1.03	135.70±15.29	40

When the data were analysed by gender, it was revealed that 26.2% of male samples and 0.7% of female samples fell into the intermediate and high-risk population in the 10-year risk classification. The stratified analysis based on age is illustrated in tables 2, 3. There was an increasing trend of mean total cholesterol and mean systolic blood pressure towards the older age groups. The age groups 20–30 years and 61–70 years had the lowest mean HDL level, 1.5±0.9 and 1.4±0.6 mmol/l respectively. The proportion of samples with an intermediate and high risk increased significantly in older subjects.

DISCUSSION

Many studies found that Framingham point scores overestimated the CHD risk among Asians and Chinese population.[10–12] Apart from the original Framingham functions, there are several assessment tools in estimating absolute risk of CHD. Chan *et al* investigated the 10-year cardiovascular risk among the Hong Kong population according to the European Task Force coronary risk chart.[13] The calculated results revealed that 68% of male population had at least a 10% risk, and 41.5% had at least a 20% risk of developing CHD within 10 years, while the rates for the female population were 48.2% and 2.8% respectively. This was dramatically different from the results of our study. The observed differences may be due to the active promotion of coronary-health and smoking-cessation programmes from the government of Hong Kong for the past 10 years. Liu *et al*[7] investigated and derived a recalibrated equation from a Framingham assessment and compared this with the Chinese Multi-provincial Cohort Study (CMCS). However, the accuracy of this calibrated equation is limited by its validity in being directly applied to the Hong Kong population. Nevertheless, the classification parameters and definition of diabetes mellitus used in the CMCS study differ from the conventional definitions used in Hong Kong.[13] A more appropriate risk-assessment method is yet to be developed. Thus, we could still use the Framingham scores as a reference.

The online calculator used in this study is the first Chinese version Framingham risk-assessment calculator available for Hong Kong people to estimate their absolute risk of developing CHD within 10 years. In order to complete the risk assessment, participants must at least obtain their recent result of blood test for lipid profile and blood pressure measurements. Apart from their laboratory results, the results of this 10-year risk assessment could be an additional tool in alerting people about their cardiovascular risk and reminding them of early primary prevention of cardiovascular-related diseases. Prevention would be the best approach to minimise the morbidity and mortality of cardiovascular diseases.[14–17] Metabolic abnormalities, including hypertension, diabetes and dyslipidaemia, are defined as metabolic syndrome, a major contributor to the development of CVD.[18–21] Apart from age, gender and family history, other risk factors for CHD such as smoking, obesity, physical inactivity and metabolic abnormalities are modifiable risk factors, which could be improved by lifestyle modification.

In Hong Kong, the prevalence of obesity, which refers to a body mass index (BMI) of ≥25 kg/m^2, varied from 25% to 33% of the population. Westernisation factors such as an unbalanced diet and physical inactivity are the main contributors to obesity.[22 23] BMI and waist circumference could be used to estimate the risk of obesity and related morbidities.[24] Obesity has been an emerging concern among children and adolescents in Hong Kong. The numbers of primary- and secondary-school students who were classified as obese increased to 14.7% and 12.4% respectively in 2001.[24] It has been revealed that overweight children would suffer from impaired arterial endothelial function and increased intima-medial thickness of carotid arteries.[25] In addition, the modernisation of lifestyle discourages people to exercise. According to surveys conducted by the Center for Health Protection in Hong Kong, only 22% of the adult population performed optimal levels of daily exercises.[25]

Furthermore, the high sodium content in the diet among the local population could be associated with developing hypertension and other cardiovascular diseases. Woo *et al* conducted a survey and revealed only 22% of subjects had a daily intake ≤2300 mg of sodium.[24] It is common to see preserved food items in Chinese diets which may lead to increase sodium intake in our population.

Moreover, the impact of CHD is affecting the younger population and is not limited to geriatric populations. In our study, 1.1% of subjects in the age group 31–40 fell into the high-risk group according to the Framingham assessment. Cardiovascular risk was found in younger age groups in diverse studies. In the USA, CHD mortality among young adults rose from 1980 to 2002, despite advances in medical treatments.[26] A similar increase was also observed in England. Mortality among young adults, aged 35–44, has increased, while mortality among those aged 45–55 declined.[27 28]

This study has several potential shortcomings. Collection of data from the internet may not extensively reach the older age groups who use information technology less frequently. This

Table 3 Framingham 10-year risk level among different age groups

Age group	Low	Intermediate	High	Total no of samples
20–30	250 (98.04)	5 (1.96)	0 (0)	255
31–40	428 (96.18)	12 (2.70)	5 (1.12)	445
41–50	876 (89.66)	77 (7.88)	24 (2.46)	977
51–60	514 (71.29)	184 (25.52)	23 (3.19)	721
61–70	57 (33.73)	88 (52.07)	24 (14.20)	169
≥71	5 (12.50)	27 (67.50)	8 (20.00)	40

may not reflect the whole scenario of current situation in Hong Kong. The Framingham 10-year risk calculator did not incorporate the assessment of subjects with concurrent comorbidities including diabetes mellitus, CHD and other health problems associated with cardiovascular risk in the calculation. Subjects with underlying CHD equivalent risk factors, including peripheral arterial disease, abdominal aortic aneurysm, symptomatic carotid artery disease and diabetes, should be conferred as having 10-year risk greater than 20%. In addition, it was not possible for us to ensure the accuracy of online data entry, since we had no access to the data-entry form if the subjects preferred to use the online entry system. Furthermore, the survey may not be sufficiently generalisable to the general population of Hong Kong, since there was no formal public announcement regarding this study in the 18 districts of Hong Kong.

CONCLUSION

The general public in Hong Kong were found to have a relatively high total cholesterol and normal to high systolic blood pressure. Almost two in every 10 Hong Kong citizens have a 10–20% or higher than 20% risk of developing CHD in the next 10 years. Thus, good lifestyle modifications and regular health screening are essential and urgently required to lower the risk of cardiovascular disease in the general public of Hong Kong.

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Competing interests None.

Ethics approval This is a public-health screening procedure.

Provenance and peer review Not commissioned; internally peer reviewed.

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