Stroke and coronary artery disease (CAD) are major causes of death throughout the world. As half of the world’s population lives in Asian countries, prevention of stroke and CAD in Asia is crucial. According to the vital statistics, East Asian countries have a lower mortality rate for CAD than for stroke. In contrast, CAD is a more common cause of death than stroke in other Asian countries and Western countries. Hypertension, diabetes, hypercholesterolemia, and smoking are major risk factors for stroke and CAD in Asia as well as in Western countries. In an observational study in Japan, the stroke incidence decreased as a result of improvements in blood pressure control and reduction in the smoking rate over the past half century, whereas the CAD incidence did not show a clear secular change, probably because the benefits of blood pressure control and smoking cessation were negated by increasing prevalence of both glucose intolerance and hypercholesterolemia. Although Asian populations have lower serum cholesterol levels than Western populations, the prevalence of hypercholesterolemia has increased during the past half century in Asia. In addition, the smoking rate among Asian men is higher than for Western men. These results underscore that, in addition to blood pressure control, smoking cessation and the management of metabolic risk factors are very important for prevention of stroke and CAD in Asia. *(Circ J 2013; 77: 1923–1932)*

**Key Words:** Asia; Coronary artery disease; Epidemiology; Risk factors; Stroke
Sure (BP) among hypertensive men and women decreased significantly throughout the study period. However, even in the recent examination in 2002, mean systolic BP (SBP) levels in hypertensive men and women were higher than 140 mmHg, suggesting that most hypertensive subjects did not achieve the target BP levels recommended by the clinical guideline for hypertension.

Smoking rates in men and women showed a significant downward trend over the study period. In contrast, the prevalence of metabolic risk factors (ie, glucose intolerance and hypercholesterolemia) increased greatly over the study period in both sexes, probably because of the Westernization of dietary habits and physical inactivity as a result of motorization.

Figure 3 shows the age-adjusted incidence rates of stroke and CAD among the first 3 cohorts of the Hisayama Study, together with 12-year follow-up data for each cohort. The incidence of stroke decreased greatly, by 48% for men and by 25% for women, from the first cohort (1961–1973) to the second cohort (1974–1986), probably because of the improvement in BP control in hypertensive subjects and the reduction in the smoking rate. Among the stroke subtypes, ischemic stroke in both sexes and intracerebral hemorrhage in men showed a similar pattern of decrease. However, the decreasing trend in the stroke incidence slowed from the second cohort to the third cohort (1988–2000) in both sexes and a possible reason for this slowdown may have been the steep increase in metabolic risk factors, which could have negated the beneficial effects of the improvement of hypertension management and smoking cessation. Another reason may have been that BP control among hypertensive individuals was still not sufficient, even at the latest examination. In contrast, the CAD incidence did not change throughout the study periods in either sex. Again, the increase in metabolic risk factors and insufficient control of hypertension may have contributed to the trend in the CAD incidence.

Secular Trends in CVD Incidence and Mortality

Although in recent years Japan has had the lowest mortality rates of stroke among Asian countries, it is worth mentioning that the stroke mortality in Japan based on vital statistics was the highest in the world in the 1950s to the 1960s, and it greatly decreased during the period from the 1970s to the 1990s. Several population-based observational studies in Japan have evaluated the secular trends in the incidence of stroke or CAD. One of these investigations, the Hisayama Study, a population-based cohort study of CVD in the town of Hisayama, Fukuoka, Japan, established 4 cohorts consisting of residents aged ≥40 years without a history of CVD in, respectively, 1961 (the first cohort, n=1,618), 1974 (the second cohort, n=2,038), 1988 (the third cohort, n=2,637), and 2002 (the fourth cohort, n=3,123). The Table summarizes the age-adjusted prevalence of cardiovascular risk factors at the baseline examinations of the 4 cohorts in the Hisayama Study. The prevalence of hypertension was stable in men and decreased slightly in women over the study period from 1961 to 2002, whereas the proportion of individuals receiving anti-hypertensive agents increased consistently with time in both sexes. As a result, the age-adjusted mean levels of blood pressure (BP) among hypertensive men and women decreased significantly throughout the study period. However, even in the recent examination in 2002, mean systolic BP (SBP) levels in hypertensive men and women were higher than 140 mmHg, suggesting that most hypertensive subjects did not achieve the target BP levels recommended by the clinical guideline for hypertension. Smoking rates in men and women showed a significant downward trend over the study period. In contrast, the prevalence of metabolic risk factors (ie, glucose intolerance and hypercholesterolemia) increased greatly over the study period in both sexes, probably because of the Westernization of dietary habits and physical inactivity as a result of motorization. Figure 3 shows the age-adjusted incidence rates of stroke and CAD among the first 3 cohorts of the Hisayama Study, together with 12-year follow-up data for each cohort. The incidence of stroke decreased greatly, by 48% for men and by 25% for women, from the first cohort (1961–1973) to the second cohort (1974–1986), probably because of the improvement in BP control in hypertensive subjects and the reduction in the smoking rate. Among the stroke subtypes, ischemic stroke in both sexes and intracerebral hemorrhage in men showed a similar pattern of decrease. However, the decreasing trend in the stroke incidence slowed from the second cohort to the third cohort (1988–2000) in both sexes and a possible reason for this slowdown may have been the steep increase in metabolic risk factors, which could have negated the beneficial effects of the improvement of hypertension management and smoking cessation. Another reason may have been that BP control among hypertensive individuals was still not sufficient, even at the latest examination. In contrast, the CAD incidence did not change throughout the study periods in either sex. Again, the increase in metabolic risk factors and insufficient control of hypertension may have contributed to the trend in the CAD incidence.
Figure 2. Age-adjusted incidence of stroke (A) and acute myocardial infarction (MI) (B) by sex in the MONICA study in 1985–1987 (orange bars indicate the Western cohorts; green bar represents the Chinese cohort) and in Japanese cohorts in 1989–1992 (blue bars), all of which consisted of subjects aged 35–64 years. FIN-KUO, Kuopio Province, Finland; FIN-NKA, North Karelia, Finland; RUS-NOI, Novosibirsk Intervention, Russia; LTU-KAU, Kaunas, Lithuania; FIN-TUL, Turku/Lomaa, Finland; YUG-NOS, Novi Sad, Yugoslavia; JPN-HOKKAIDO, Hokkaido, Japan; JPN-SHIGA, Shiga, Japan; CHN-BEI, Beijing, China; SWE-NSW, Northern Sweden, Sweden; RUS-MOC, Moscow Control, Russia; JPN-AKITA, Akita, Japan; RUS-MOI, Moscow Intervention, Russia; JPN-Okinawa, Japan; DEN-GLO, Glostrup, Denmark; JPN-NAGANO, Nagano, Japan; GER-KMS, Karl-Marx-Stadt County, Germany; GER-HAC, Halle County, Germany; POL-WAR, Warsaw, Poland; JPN-OSAKA, Osaka, Japan; SWE-GOT, Gothenburg, Sweden; GER-RDM, Rest of DDR (East Germany)-MONICA; GER-RHN, Rhein-Neckar Region, Germany; ITA-FRI, Friuli, Italy; UNK-BEL, Belfast, United Kingdom; CAN-HAL, Halifax County, Canada; ICE-ICE, Iceland; USA-STA, Stanford (California), United States; CZE-CZE, Czech Republic; NEZ-AUC, Auckland, New Zealand; AUS-PER, Perth, Australia; BEL-GHE, Ghent, Belgium; GER-EGE, East Germany; SWI-TIC, Ticino, Switzerland; FRA-LIL, Lille, France; SWI-VAF, Vaud/Fribourg, Switzerland; SPA-CAT, Catalonia, Spain.
Table. Age-Adjusted Prevalence or Mean of Cardiovascular Risk Factors Among 4 Baseline Examinations of the Hisayama Study

<table>
<thead>
<tr>
<th></th>
<th>1961 (n=1,618)</th>
<th>1974 (n=2,038)</th>
<th>1988 (n=2,637)</th>
<th>2002 (n=3,123)</th>
<th>P for trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertension, %</td>
<td>38.4</td>
<td>43.1</td>
<td>44.1</td>
<td>42.0</td>
<td>0.25</td>
</tr>
<tr>
<td>Antihypertensive agents, %</td>
<td>2.0</td>
<td>8.4</td>
<td>13.2</td>
<td>18.2</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>SBP in hypertensive men, mmHg</td>
<td>162</td>
<td>157</td>
<td>151</td>
<td>148</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>DBP in hypertensive men, mmHg</td>
<td>91</td>
<td>90</td>
<td>87</td>
<td>89</td>
<td>0.011</td>
</tr>
<tr>
<td>Glucose intolerance, %</td>
<td>11.6</td>
<td>14.1</td>
<td>39.3</td>
<td>54.5</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hypercholesterolemia, %</td>
<td>2.8</td>
<td>12.2</td>
<td>26.9</td>
<td>25.8</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Current smoking, %</td>
<td>75.0</td>
<td>73.3</td>
<td>50.4</td>
<td>46.9</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Women</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertension, %</td>
<td>35.9</td>
<td>40.1</td>
<td>35.1</td>
<td>31.3</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Antihypertensive agents, %</td>
<td>2.1</td>
<td>7.4</td>
<td>13.4</td>
<td>16.6</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>SBP in hypertensive women, mmHg</td>
<td>163</td>
<td>161</td>
<td>154</td>
<td>149</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>DBP in hypertensive women, mmHg</td>
<td>88</td>
<td>87</td>
<td>83</td>
<td>86</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Glucose intolerance, %</td>
<td>4.8</td>
<td>7.9</td>
<td>30.0</td>
<td>35.5</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hypercholesterolemia, %</td>
<td>6.6</td>
<td>19.9</td>
<td>41.6</td>
<td>41.6</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Current smoking, %</td>
<td>16.6</td>
<td>10.2</td>
<td>6.9</td>
<td>8.5</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

SBP, systolic blood pressure; DBP, diastolic blood pressure. Hypertension defined as SBP ≥140 mmHg or DBP ≥90 mmHg or current use of antihypertensive agents. Hypercholesterolemia defined as total cholesterol level ≥5.7 mmol/L.

Figure 3. Age-adjusted incidence of stroke and coronary artery disease (A) and stroke subtypes (B) by sex among the 3 cohorts of the Hisayama Study with a 12-year follow-up in each cohort. *P<0.05 vs. the first cohort (1961–1973); †P<0.05 vs. the second cohort (1974–1986).
A decreasing trend in the stroke incidence was also observed by other population-based epidemiological studies in Japan.\textsuperscript{10-13} On the other hand, the secular trend in CAD incidence in Japan has tended to vary among studies.\textsuperscript{10,11,14} The Adult Health Study,\textsuperscript{14} a population-based cohort study performed in the cities of Hiroshima and Nagasaki, showed an almost constant incidence of MI during the 26-year period from 1958 to 1984. The Akita-Osaka Study\textsuperscript{16} demonstrated a significant increase in the CAD incidence among middle-aged men (aged 40–69 years) living in an urban area (Osaka) during the period from 1964 to 2003. There were no clear secular changes in the CAD incidence among urban women in Osaka and among rural men and women in Akita. Another cohort study in Osaka\textsuperscript{11} also showed an increasing trend in the CAD incidence among middle-aged men (aged 40–59 years) during the period from 1963 to 1994. To summarize: the stroke incidence in Japan clearly decreased over the past half century, but the CAD incidence did not decrease. For middle-aged men in urban areas of Japan, CAD incidence may have increased because of Westernization of the Japanese lifestyle.

In other Asian countries, there have been few studies on CVD trends based on vital statistics.\textsuperscript{16-18} A study in China reported that the stroke mortality (per 100,000 persons) in urban areas decreased remarkably during the period from 1987 to 2001 (from 373.9 to 258.1 for men, from 302.9 to 179.5 for women), but with little change in rural areas over the same period (from 321.6 to 336.8 for men, from 249.7 to 227.5 for women).\textsuperscript{16} This finding suggests that healthcare services are less developed in rural areas than in urban areas in China. A study in Taiwan showed that the mortality rate of stroke decreased during the period from 1974 to 1988 and the decline was much more striking for hemorrhagic stroke than for ischemic stroke.\textsuperscript{17} Another study in Taiwan\textsuperscript{18} reported that the CAD mortality increased slowly from 1971 to 1992. During that period, the levels of cigarette smoking, dietary fat intake and body mass index, and the prevalence of both hypertension and diabetes increased. However, a downward trend in the CAD mortality was observed from 1992 to 2001, probably attributable to improvements in acute cardiac care and medical treatment for patients with CAD in Taiwan.

### Risk Factors for CVD

#### Hypertension

It is well established that hypertension is a strong risk factor for both stroke and CAD. In a systematic review of cross-sectional studies,\textsuperscript{19} the age-adjusted prevalence rates of hypertension among adult populations were 38.3% in Japan, 27.7% in China, 23.7% in Taiwan, 21.7% in Thailand, 23.8% in North India (urban), and 30.7% in West India (urban). The prevalence of hypertension in Japan seems to be higher than that in other Asian countries, but it is difficult to make an accurate comparison because the methods for data collection and BP measurement were not standardized among the studies examining this issue. In any event, we may roughly conclude that one-quarter or one-third of the adult population in Asia...
The development of total CVD were 1.41 (1.31–1.53) for prehypertension, 1.81 (1.61–2.04) for isolated diastolic hypertension, 2.18 (2.00–2.37) for isolated systolic hypertension, and 3.42 (3.17–3.70) for systolic-diastolic hypertension, compared with normal BP as a reference. In a separate analysis, the prehypertensive and hypertensive states were also found to have a significant influence on the development of certain CVD subtypes, namely, ischemic stroke, hemorrhagic stroke, and CAD. The influence of high BP was stronger for hemorrhagic stroke than for ischemic stroke and CAD. These associations were stronger in Asian populations than in Oceanic populations.

The Hisayama Study reported the association of BP level with the incidence of CVD using a cohort established in 1988. A total of 2,634 residents aged ≥40 years without a history of CVD were followed up for 19 years. BP categories were defined according to the JNC7 classification with a modification: namely, normal BP (<120/80 mmHg), lower range of prehypertension (120–129/80–84 mmHg), higher range of prehypertension (130–139/85–89 mmHg), stage 1 hypertension (140–149/90–99 mmHg), and stage 2 hypertension (≥150/100 mmHg). The incidence of CVD rose progressively with increasing BP, and increased significantly from the lower range of prehypertension. The multivariable-adjusted HRs (95% CIs) were 1.58 (1.11–2.26) for lower range of prehypertension, 1.70 (1.18–2.44) for higher range of prehypertension, 1.93 (1.37–2.72) for stage 1 hypertension, and 2.78 (1.93–4.01) for stage 2 hypertension, compared with normal BP as a reference, after adjustment for potential confounding factors. The CVD development of total CVD were 1.41 (1.31–1.53) for prehypertension, 1.81 (1.61–2.04) for isolated diastolic hypertension, 2.18 (2.00–2.37) for isolated systolic hypertension, and 3.42 (3.17–3.70) for systolic-diastolic hypertension, compared with normal BP as a reference. In a separate analysis, the prehypertensive and hypertensive states were also found to have a significant influence on the development of certain CVD subtypes, namely, ischemic stroke, hemorrhagic stroke, and CAD. The influence of high BP was stronger for hemorrhagic stroke than for ischemic stroke and CAD. These associations were stronger in Asian populations than in Oceanic populations.

The Asia Pacific Cohort Studies Collaboration (APCSC) is a large-scale meta-analysis of 44 cohort studies with approximately 600,000 participants from Asia (China, Hong Kong, Taiwan, Japan, South Korea, Singapore, and Thailand) and Oceania (Australia and New Zealand). The influence of high BP on the development of stroke and CAD was evaluated using the individual participant data of the APCSC, which had a mean follow-up period of 7 years. In that study, BP categories were classified as normal (SBP <120 mmHg and diastolic blood pressure [DBP] <80 mmHg), prehypertension (SBP 120–139 mmHg and/or DBP 80–89 mmHg), isolated diastolic hypertension (SBP <140 mmHg and DBP ≥90 mmHg), isolated systolic hypertension (SBP ≥140 mmHg and DBP <90 mmHg), and systolic-diastolic hypertension (SBP ≥140 mmHg and DBP ≥90 mmHg). As shown in Figure 4, multivariable-adjusted hazard ratios (HRs) (95% confidence intervals [CIs]) for the development of ischemic stroke were 1.81 (1.61–2.04) for isolated diastolic hypertension, 2.18 (2.00–2.37) for isolated systolic hypertension, and 3.42 (3.17–3.70) for systolic-diastolic hypertension, compared with normal BP as a reference. In a separate analysis, the prehypertensive and hypertensive states were also found to have a significant influence on the development of certain CVD subtypes, namely, ischemic stroke, hemorrhagic stroke, and CAD. The influence of high BP was stronger for hemorrhagic stroke than for ischemic stroke and CAD. These associations were stronger in Asian populations than in Oceanic populations.

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In the Hisayama Study, a total of 2,421 Japanese participants who underwent the 75 g OGTT in 1988 were followed up for 14 years to estimate the association between glucose tolerance status and the development of CVD. In that study, glucose tolerance status was determined by the WHO criteria in 1998: namely, normal glucose tolerance (fasting plasma glucose [FPG] <6.1 mmol/L and 2-h postload glucose [2 hPG] <7.8 mmol/L), impaired fasting glycemia (FPG 6.1–6.9 mmol/L and 2 hPG <7.8 mmol/L), impaired glucose tolerance (FPG <7.0 mmol/L and 2 hPG 7.8–11.0 mmol/L), and diabetes (FPG ≥7.0 mmol/L and/or 2 hPG ≥11.0 mmol/L). As shown in Figure 5, the risks of ischemic stroke in both sexes and CAD in women were significantly higher in subjects with diabetes than in those with normal glucose tolerance, even after adjustment for other confounding factors. The risks of ischemic stroke and CAD did not significantly increase in subjects of either sex with impaired fasting glycemia or impaired glucose tolerance.

Diabetes Mellitus
According to nationally representative data, the prevalence of diabetes was 2.6% in China, 3.1% in Mongolia, 4.3% in India, 5.1% in Taiwan, 6.4% in the Philippines, 6.9% in Malaysia, 8.2% in Singapore, 9.6% in Thailand, 9.7% in Hong Kong, and 10.5% in South Korea. In Japan, the National Health and Nutrition Survey reported that the prevalence of diabetes mellitus (using a 75 g oral glucose tolerance test (OGTT) and including impaired fasting glycemia, impaired glucose tolerance, and diabetes mellitus) among residents aged ≥40 years was 11.9% in total (16.9% in men and 8.4% in women) in 2011. The Hisayama Study in Japan reported that the prevalence of glucose intolerance (using a 75 g oral glucose tolerance test (OGTT) and including impaired fasting glycemia, impaired glucose tolerance, and diabetes mellitus) among residents aged ≥40 years was 54.5% in men and 35.5% in women in 2002, suggesting that more than half of adult men and one-third of adult women have diabetes or prediabetes in Japan. The prevalence of glucose intolerance in this town increased greatly during the past half century (Table).

In the APCSC, the association of diabetes with the risk of CVD was evaluated (median 5.4 years of follow-up). In that study, glucose tolerance status was determined by a reported medical history of diabetes at baseline. The HRs (95% CIs) associated with diabetes were 2.02 (1.57–2.59) for fatal stroke, 2.19 (1.81–2.66) for fatal CAD, 2.09 (1.65–2.64) for total (fatal and nonfatal) stroke, and 1.73 (1.34–2.22) for total CAD. For all outcomes, HRs were similar in the Asian and Oceanic populations. In another
For example, the Hisayama Study in Japan reported that the age-adjusted prevalence of hypercholesterolemia (defined as total cholesterol [TC] ≥ 5.7 mmol/L) increased from 2.8% to 25.8% in men and from 6.6% to 41.6% in women during the period from 1961 to 2002 (Table). The increase in serum cholesterol levels in Asian countries may be associated with the increase in dietary intake of fat.34–36 Many epidemiological studies in Asia have confirmed the association of cholesterol with the risk of CVD.37–41 The Korean National Health System Prospective Cohort Study reported that serum cholesterol was positively associated with the development of ischemic stroke and MI, and inversely associated with hemorrhagic stroke, using 11-year follow-up data from 787,442 Korean men and women aged 30–64 years (Figure 6). Multivariable-adjusted HRs (95% CIs) per 1 mmol/L increase in cholesterol were 1.20 (1.16–1.24) for ischemic stroke, 0.91 (0.87–0.95) for hemorrhagic stroke, and 1.48 (1.43–1.53) for MI. The APCSC study evaluated the association of TC with the risk of CVD using the median 5.5-year follow-up data. Overall, each 1 mmol/L higher level of TC was associated with an increased risk of coronary death (HR 1.35, 95% CI 1.26–1.44) and fatal or nonfatal ischemic stroke (HR 1.25, 95% CI 1.13–1.40), and a decreased risk of fatal hemorrhagic stroke (HR 0.80, 95% CI 0.70–0.92). The Hisayama Study in Japan demonstrated that the risks of de-

Figure 7. Multivariable-adjusted hazard ratios (HRs) and their 95% confidence intervals (CIs) for the development of stroke subtypes and myocardial infarction according to smoking status in Korean men aged 30 to 64 years enrolled in the Korean National Health System Prospective Cohort Study.43 HRs were adjusted for age, height, blood pressure, body mass index, total cholesterol, hyperglycemia, alcohol consumption, regular exercise, income, and area of residence. Never smoking was used as the reference group. The center of each solid box is plotted against the point estimate, and the horizontal lines are drawn to the 95% CIs.

study using the data from the APCSC,33 there was a positive log-linear association between fasting glucose and the risk of total stroke and CAD. For both outcomes, the association was continuous down to at least 4.9 mmol/L, with no evidence of a threshold level. Overall, a 1 mmol/L lower fasting glucose level was associated with a 21% (95% CI 18–24%) lower risk of total stroke and a 23% (19–27%) lower risk of total CAD. The associations were similar between the Asian and Oceanic populations. Removing those with diabetes at baseline did not substantially affect the associations, suggesting that high fasting blood glucose is an important determinant of CVD even in nondiabetic subjects.

In summary, diabetes is an important risk factor for stroke and CAD in Asian populations. The APCSC study suggests that a higher blood glucose level is associated with an increased risk of CVD even in subjects without diabetes, although the Hisayama Study did not show an increased risk of CVD among subjects with prediabetes (impaired fasting gly-
cemia or impaired glucose intolerance). Further accumulation of evidence is needed to determine whether hyperglycemia increases the risk of CVD among nondiabetic subjects.

Hypercholesterolemia

In Western countries, CAD is related to high serum cholesterol levels, whereas in Asian countries, serum total cholesterol levels are generally low and the CAD incidence is much lower. However, together with the growing industrialization and urbanization in Asia, serum total cholesterol levels in Asian countries have increased during the past 50 years. For example, the Hisayama Study in Japan reported that the age-adjusted prevalence of hypercholesterolemia (defined as total cholesterol [TC] ≥ 5.7 mmol/L) increased from 2.8% to 25.8% in men and from 6.6% to 41.6% in women during the period from 1961 to 2002 (Table). The increase in serum cholesterol levels in Asian countries may be associated with the increase in dietary intake of fat.34–36 Many epidemiological studies in Asia have confirmed the association of cholesterol with the risk of CVD.37–41 The Korean National Health System Prospective Cohort Study reported that serum cholesterol was positively associated with the development of ischemic stroke and MI, and inversely associated with hemorrhagic stroke, using 11-year follow-up data from 787,442 Korean men and women aged 30–64 years (Figure 6). Multivariable-adjusted HRs (95% CIs) per 1 mmol/L increase in cholesterol were 1.20 (1.16–1.24) for ischemic stroke, 0.91 (0.87–0.95) for hemorrhagic stroke, and 1.48 (1.43–1.53) for MI. The APCSC study evaluated the association of TC with the risk of CVD using the median 5.5-year follow-up data. Overall, each 1 mmol/L higher level of TC was associated with an increased risk of coronary death (HR 1.35, 95% CI 1.26–1.44) and fatal or nonfatal ischemic stroke (HR 1.25, 95% CI 1.13–1.40), and a decreased risk of fatal hemorrhagic stroke (HR 0.80, 95% CI 0.70–0.92). The Hisayama Study in Japan demonstrated that the risks of de-
veloping nonembolic brain infarction and CAD were elevated in subjects with high levels of low-density lipoprotein cholesterol, but no clear association was observed for the risk of hemorrhagic stroke. The Japan Arteriosclerosis Longitudinal Study-Existing Cohorts Combine reported that non-high-density lipoprotein (non-HDL) cholesterol was a more reliable predictor for the development of acute MI than TC, but neither TC nor non-HDL cholesterol was associated with any stroke subtype.

To summarize, hypercholesterolemia is generally a risk factor for atherosclerotic diseases such as ischemic stroke and MI in Asian populations. Because the prevalence of hypercholesterolemia has increased in Asia during the past half century, the management of serum cholesterol is important to prevent atherosclerotic disease in the future.

**Smoking**

According to the WHO report, the smoking rate in Asian men (approximately >40%) is much higher than that in Western men (30–40%). In contrast, the smoking rate in Asian women (<20%) is much lower than that in Western women (20–40%). Smoking is reported to be a risk factor for both stroke and CAD. In the Korean National Health System Prospective Cohort Study, the association of smoking with the development of CVD was assessed using a large-scale cohort consisting of 648,346 Korean men with a 10-year follow-up. As shown in Figure 7, there were strong linear trends of increased risk of ischemic stroke, subarachnoid hemorrhage, and MI with greater number of cigarettes smoked per day. However, smoking was not associated with intracerebral hemorrhage. Similarly, the Hisayama Study in Japan reported that smoking was a significant risk factor for ischemic stroke, subarachnoid hemorrhage, and CAD, but not for intracerebral hemorrhage. The Japan Public Health Center-based Prospective Study on Cancer and Cardiovascular Disease (JPHC Study) also reported that smoking raised the risks of ischemic stroke and subarachnoid hemorrhage. In the APSCS study, the association of smoking with CVD was evaluated using the data from a median 6.8 years of follow-up. In that study, the HR (95% CI) comparing current smokers with nonsmokers was 1.32 (1.24–1.40) for stroke and 1.60 (1.49–1.72) for CAD. There was a clear dose-response relationship between the number of cigarettes smoked per day and both stroke and CAD. The HR (95% CI) for ex-smokers compared with current smokers was 0.84 (0.76–0.92) for stroke and 0.71 (0.64–0.78) for CAD, suggesting that quitting smoking has a clear benefit.

To summarize, smoking is a risk factor for CAD and stroke (particularly ischemic stroke and subarachnoid hemorrhage) in Asian populations. Because smoking rates in men in Asian populations are much higher than those in men in Western populations, smoking cessation is very important for the prevention of CVD in Asia.

**Conclusions**

We reviewed the vital statistics and data from observational studies in Asia in order to understand the burden of CVD and the influence of risk factors. Asian populations are characterized by higher stroke mortality, and East Asian populations have lower CAD mortality and incidence than Western populations. Hypertension, diabetes, hypercholesterolemia, and smoking were common risk factors for CVD in Asian populations as well as in Western populations. The prevalence rates of hypercholesterolemia in Asia have increased during the past half century, and the smoking rates in Asian men are much higher than those in Western men. Therefore, management of metabolic risk factors and smoking cessation, as well as BP control, are very important for the prevention of CVD in Asian countries.

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**References**
