

## Prevention of coronary heart disease in south Asia

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**The great increase in rates of cardiovascular disease in developing countries will probably have grave implications for south Asia, which houses nearly a quarter of the world's population. Several factors might contribute to this effect, such as increased susceptibility of south Asian people to cardiovascular disease, unrecognised targets for preventive interventions, and restricted access to high-cost tertiary cardiovascular care for economically disadvantaged communities. Furthermore, prevention and control of cardiovascular disease does not feature prominently in the health care agendas of south Asian countries. To address these issues, therefore, a multifaceted approach is needed, which should include epidemiological studies to fill in the gaps in knowledge. Additionally, political, social, cultural, and economic issues need to be considered in prevention and control of these diseases, to identify and address key limitations and opportunities specific to the region. A set of recommendations outlining the approach is crucial.**

Cardiovascular diseases are becoming a major health burden in developing countries. In the year 2000, 16.7 million people died from cardiovascular disease, accounting for 30.3% of all deaths worldwide; more than half these deaths were in developing countries.<sup>1</sup> South Asia (Pakistan, India, Bangladesh, Nepal, and Sri Lanka) represents more than a quarter of the developing world, and is likely to be strongly affected by the increase in cardiovascular disease, for several reasons. First, people from south Asia are known to have a high coronary risk; this tendency has been well recorded in studies of expatriate south Asians<sup>2,3</sup> and has also been shown in native settings.<sup>4-10</sup> Additionally, precise targets for preventive interventions are largely unrecognised for this population. On the other hand, access to tertiary health care is severely restricted because of low availability and high cost. According to World Bank dollar-a-day estimates, of the 1.3 billion people living below the poverty line worldwide, 40% (515 million) live in south Asia, and the gross national product per capita in that region is only US\$393, compared with \$1250 for the rest of the developing world (table 1).<sup>11</sup> We therefore need to prioritise the preventive approach to cardiovascular disease. Investment in prevention is highly cost-effective and has contributed substantially to the fall in incidence of these diseases and in mortality rates in developed countries;<sup>13</sup> similar results can be expected for developing regions. However, several political, social, cultural, and economic issues need to be considered, so that any key limitations and opportunities specific to these countries are identified and addressed.

### Epidemiology of coronary heart disease

Coronary heart disease (CHD) is the most important preventable cardiovascular disease, and its epidemiology is better understood than that of other such diseases. However, all major preventable cardiovascular diseases are linked by common risk factors and can be controlled through a common strategy; therefore I will discuss CHD as an example of the cardiovascular disease burden in south Asia.

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Insight into risk of CHD in south Asian people comes from the study of expatriates, who have higher prevalence and definite evidence of excess mortality from CHD than do other ethnic groups.<sup>2</sup> This trait was described initially for colonial plantation workers in the Pacific islands in the early 1950s,<sup>14</sup> and was later confirmed by mortality and morbidity data from other parts of the world.<sup>15,16</sup> This excess risk of CHD cannot be explained entirely in each south Asian subgroup by conventional risk factors alone,<sup>2</sup> though such risk factors are highly prevalent in south Asians,<sup>17</sup> since the strength of association of risk factors varies between ethnic groups. However, expatriates from south Asia have increased risk of type 2 diabetes,<sup>18</sup> adverse fat distribution, hyperinsulinaemia, and insulin resistance, relative to other ethnic groups.<sup>19</sup> Insulin resistance is known to underlie the raised risk of coronary artery disease in this population,<sup>20</sup> possibly through lipid mediated and inflammatory mechanisms.

Further evidence that coronary risk might be related to lipoprotein comes from the study of the lipoprotein profile in Afro-Caribbeans who have similar prevalence rates of diabetes but lower rates of coronary artery disease than people from southern Asia.<sup>21</sup> Increased central obesity and insulin resistance account for higher concentrations of markers of inflammation (such as C-reactive protein), which indicate the extent of inflammation in atheromatous lesions or might contribute to atherothrombosis itself.<sup>22</sup>

That the coronary risk in south Asians also seems to be genetically determined is shown by the strong association of CHD with lipoprotein A,<sup>23</sup> which has the highest heritability index of all the lipoproteins. Genes may also have a role through insulin resistance. The effect of genes

	Pakistan	India	Bangladesh	Nepal	Sri Lanka
Average monthly household income*†	90.23	49.42	75.21	60.08	116.41
Average household size*	6.70	5.60	5.00	5.10	5.50
Total per-capita health expenditure‡	18	20	12	11	26
Private sector per-capita health expenditure‡	13.95	16.8	6.33	8.4	14.26
Public sector per-capita health expenditure‡	4.05	3.2	5.67	2.6	11.74

\*Data from the economic reviews of the respective countries. †Converted to US\$ on the basis of exchange rates as of July 18, 2001. ‡Data from the World Bank Report<sup>12</sup>

Table 1: Household income and per-capita health expenditure (\$US) in south Asian countries

on risk of CHD becomes fully apparent when people migrate from south Asia to more affluent environments and acquire western behaviours; their insulin resistance increases, along with the risk of CHD associated with lipoprotein A and LDL cholesterol.<sup>24</sup>

However, several issues emerge. First, estimates of excess risk in south Asians were thought to be imprecise,<sup>25</sup> since data for only prevalence, mortality, and health care use were presented. However, we now have data for incidence that confirm the increased susceptibility of Asian Indian men to coronary artery disease.<sup>3</sup> Second, prevalence data are further confounded by difficulties such as reluctance to provide care or by delays in access to care; however, to extrapolate that the reported increase in risk of coronary artery disease is largely caused by such inaccessibility seems unreasonable. Moreover, Asian communities residing in the UK have different religious, cultural, geographical, and genetic backgrounds, and therefore might be expected to differ with respect to conventional risk factors; however, all such groups show rates of mortality from coronary artery disease that are 50% higher than that of the appropriate national average.<sup>15</sup>

In the indigenous population of south Asia, high prevalence rates for CHD risk factors are also apparent (table 2). In India, prevalence of coronary artery disease has been reported as being 11% in 2001;<sup>4</sup> however, sizeable populations such as in Pakistan have no published data for prevalence or incidence of coronary artery disease, and causal and temporal relations between risk factors and this disease have not been established. In this context, south Asia has also been conspicuously absent from several global initiatives established to track risk of coronary artery disease ([www.ktl.fi/monica](http://www.ktl.fi/monica), accessed July 15, 2002).

Thus, three priority areas need to be addressed: first, to identify fully the risk characteristics of this population and define targets for preventive interventions; second, to formulate preventive strategies on the basis of available information; and last, to recognise and address issues that relate to prevention of CVD in south Asia.

### Social, political, and cultural issues

Preventive strategies should take into consideration the risk factors that are specific to this population. Previous recommendations have emphasised risk factors in which differences in management are warranted, such as reduction of cutoff points for body-mass index (BMI) and waist-hip ratio, and an increased role for dietary interventions.<sup>26</sup> These recommendations do not, however, detail cultural issues that are specific to risk factor modification, such as the role of physical activity in Muslim cultures, or tobacco use in south Asian populations; nor do they address the social and political issues relating to prevention that are critical during the implementation of risk factor modification approach in any setting.

### Prevention

The prevention of cardiovascular disease warrants changes at several levels, and would need the behavioural, social, political, and economic will to forge such changes among individuals, communities, health systems, and health policy makers. These considerations have hampered implementation of the ideal prevention module even in the best of circumstances. In south Asia, the traditional focus on communicable diseases and reproductive health issues places non-communicable diseases in the background. We should, therefore, recognise and include prevention of CVD as part of the primary health care strategy in south

	Pakistan <sup>6</sup>	India <sup>6,7</sup>	Bangladesh <sup>8</sup>	Nepal <sup>10</sup>	Sri Lanka <sup>9</sup>
Hypertension*	..	..	..	..	..
Men	17%	36.4%	9.8%	..	17%
Women	..	37.5%	15.6%	..	..
Cigarette smoking	..	..	..	73.7%	..
Men	34%	36.5%	50.3%	..	57.9%
Women	12.5%	11.7%	2.9%	..	..
Oral smokeless tobacco	10%	22%	..	..	..
Men	..	..	16.3%	..	..
Women	..	..	21.4%	..	..
Diabetes†	5%	..	..	..	..
Men	..	13.1%	2.9%	..	5.8%
Women	..	11.3%	0.7%	..	..
Hypercholesterolaemia‡	12.6%	..	..	..	..
Men	..	37.4%	2.8%	..	12.6%
Women	..	4.1%	3%	..	..

Data for individuals aged 15–30 years. \*Classified according to WHO criteria.

†Defined as random blood sugar of greater than 140 mg/dL (7.8 mmol/L) in all apart from the study from India, where a fasting cutoff of 126 mg/dL (7.0 mmol/L) was used. ‡Defined as a total cholesterol level greater than 200–240 mg/dL (11.1–13.3). National data for Pakistan are shown whereas other studies are regional.

Table 2: Prevalence of cardiovascular disease risk states in south Asian countries

Asian countries. International health organisations, bilateral donors, and economic development agencies that contribute a substantial share towards public sector expenditure for health development are in a position to influence health care agendas in south Asian countries and should use this influence effectively.

### Economic consequences of cardiovascular disease:

CVD has severe economic consequences that result from premature death, long-term disability, and costs for patients. Additionally, poor patients with CVD are likely to be marginalised and their increasing numbers, as the CVD epidemic matures, will probably lead to great inequalities in healthcare; furthermore, there would be serious implications for women, who have fewer opportunities to access care in a gender-biased culture. If people were aware of the effect of CVD on underprivileged communities, they might understand that prevention of CVD is synonymous with global development policies directed at poor people. Perhaps the development sector might become engaged in this effort.

### Programme

By western standards, most public health systems in south Asia are ill equipped and underfunded to implement comprehensive control policies for CVD. However, channels such as those created through primary health care and social welfare activities have outreach at grass roots level, and integrate public and private sector health services with the community. These channels can be used to offer a cost-effective alternative to independent vertical programmes for CVD control in the face of resource constraints.

### Health professionals

Health professionals have a crucial role in influencing lifestyle decisions locally in poor countries. However, most health care delivery in south Asia is through formally and informally trained and traditional health professionals, who should become part of prevention strategies for CVD to obtain the maximum effect. CVD can be included cost-effectively in existing training programmes for these health professionals. A clinically recognised focal point, such as opportunistic screening of blood pressure, should be used to draw them and the communities into the programme.<sup>27</sup> Training should also address the needs of health

professionals who do not have the support of specialised services such as anti-smoking clinics.

#### Communities

The tightly-knit community structure in south Asia could facilitate dissemination of messages. Healthier lifestyles can be promoted at mosques and temples, by advocating exercise before and after prayer, and by inclusion of fruits rather than sweets in Prasad (food served at religious meetings). The problem of smoking tobacco could also be addressed in a religious context.

#### Risk factor modification: clinical guidelines

Prevention encompasses both public health and clinical approaches, targeting the general population and those at high risk, and can be achieved through lifestyle interventions, screening, and management of risk factors. Undoubtedly, poor countries need to prioritise the population-based approach, which should allow for differences in risk factors between populations. There are known differences in risk factors in south Asians.

First, there are many indications that in Asians the risk of diabetes starts to increase rapidly when BMI or waist circumference are well within the accepted range for Europeans; therefore cutoff points recommended for white European populations will not help to identify Asian individuals at high risk.<sup>28</sup>

In south Asia tobacco is used for smoking and chewing. The cardiovascular effects of chewing tobacco are similar to those of cigarette smoking,<sup>29</sup> so guidelines on tobacco use should encourage cessation of all tobacco use.

Physical activity offers additional advantages for risk reduction in south Asians because highly prevalent risk factors such as low HDL, central obesity, and insulin resistance, respond well to exercise. Such activity is, however, culturally unacceptable for most Muslim women, who should be encouraged to exercise in an environment

and form that respects religious proscriptions; endorsement from Islamic religious leaders is crucial for the success of such practice.

Although some investigators have shown a strong association of total cholesterol and LDL with coronary artery disease,<sup>30</sup> other findings suggest that this disease arises at lower lipid concentrations in people from south Asia than in those from other regions.<sup>31</sup> On the other hand, characteristic lipid abnormalities, such as high triglycerides and low HDL with normal LDL values, are common in association with insulin resistance. Hence, European/American recommendations of the use of statins as first-line agents may not be entirely applicable to all populations. Only data from the Heart Protection Study clearly show benefit with LDL reduction from 2.5 mmol/L, where a 24% reduction in events was observed. This suggests that clinical endpoint trials will be required in the south Asian setting to define the best therapeutic strategy for treatment of CHD. Costs of coronary prevention might not be prohibitive, if generic drugs are used.

Rural communities have lower risk factors than urban westernised populations; this difference may be attributable to a low fat (15–20 g per day) diet based on whole grain (400 g per day) combined with physically demanding occupations. With the rapid rural-to-urban migration in south Asia,<sup>24,33</sup> risk reduction strategies should therefore focus on protection of healthy lifestyles.

Cost greatly affects compliance in south Asia, where health insurance is virtually non-existent and most expenses are borne by patients; analysis of the cost of therapeutic packages for various cardiovascular risks, viewed against household incomes and health expenditure, shows that the ideal drug therapy is unaffordable for most.<sup>34</sup> A cost-based approach should therefore be included in therapeutic recommendations, to facilitate treatment choices according to resources.

#### Policy recommendations

- Prevention of CVD should be recognised as part of primary health care and given appropriate priority alongside reproductive and nutritional health and communicable diseases CVD prevention should be regarded as synergistic with poverty reduction strategies, and thus addressed in development projects
- Policy changes should integrate heart health into communicable, reproductive, and population control programmes, to create cost-effective and time effective opportunities for prevention
- Policy change with respect to CVD must include relevant areas in the domains of food and nutrition, tobacco, agro-industrial diversification, urban planning, education and rural development
- Policy issues for tobacco should be dealt with in two stages. Initial priorities should focus on goals that are realistically achievable in the short-term or medium-term, such as constraints on advertising and sale to minors, statutory warnings on labels, legislation to ban smoking in public places and on public transport. Subsequently, major policy issues, such as agroindustrial policies favouring tobacco substitution, and transnational marketing of tobacco, which might affect pricing, production, and taxation, could be initiated in parallel
- Policy change should address transport, urban planning, and neighbourhood development to promote physical fitness
- Physical activity should be encouraged for Muslim women in an environment and form that respects religious proscriptions
- Policies should ensure availability of effective drugs, devices, and procedures at affordable prices, to be used cost-effectively

#### Public health recommendations

- Human resource and infrastructure capacity should be developed to support practically relevant epidemiological studies, implementation research for heart health programmes, and research on the political economy of heart health
- Culturally and linguistically appropriate and effective community health promotion and disease prevention programmes should be encouraged and made available; if they already exist they should be strengthened and integrated with the formal health care sector
- Cardiovascular disease prevention should be integrated with primary health care
- Cardiovascular health education should be integrated with other health promotion initiatives
- The public health approach should target population-wide lifestyle intervention, screening for high blood pressure, and screening of the high-risk group for diabetes and hypercholesterolaemia
- Cardiovascular health promotion should be part of the national media strategy
- Cardiovascular health should be addressed in school as part of the science or health education curriculum, or both
- Cardiovascular health education should be offered in places of religious worship and worksites where appropriate
- Cost-effective and customised diagnostic and management algorithms for management of all common cardiovascular diseases should be developed and disseminated
- Customised risk-management curriculum should be introduced for physicians and health professionals during formal and informal training

A set of guidelines and recommendations broadly outlining the overall approach to CVD is crucial. The South Asian Association for Regional Cooperation (SAARC) Cardiac Society developed guidelines for prevention of CVD for South Asia (panel). The full guidelines can be accessed at [heartfile.org/saarc.htm](http://heartfile.org/saarc.htm).

#### Conflict of interest statement

None declared.

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#### References

- World Health Organization. The World Health Report 2001, health systems: improving performance. Geneva: World Health Organization, 2001.
- McKeigue PM, Miller GJ, Marmot MG. Coronary heart disease in south Asians overseas. *J Clin Epidemiol* 1989; **42**: 597–609.
- Lee J, Heng D, Chia KS, Chew SK, Tan BY, Hughes K. Risk factors and incident coronary heart disease in Chinese, Malays and Asian Indian males: the Singapore Cardiovascular Cohort Study. *Int J Epidemiol* 2001; **30**: 983–88.
- Mohan V, Deepa R, Rani SS, Premalatha G. Prevalence of coronary artery disease and its relationship to lipids in a selected population in South India: the Chennai Urban Population Study (Cups No. 5). *J Am Coll Cardiol* 2001; **38**: 683–704.
- Pakistan Medical Research Council. National Health Survey of Pakistan 1990–94: health profile of the people of Pakistan. Islamabad: Network publication service, 1998.
- Gupta R, Gupta VP, Sarna M, et al. Prevalence of coronary heart disease and risk factors in an urban Indian population: Jaipur Heart Watch-2. *Indian Heart J* 2002; **54**: 59–66.
- Fernandes VL, Kottke TE, Nicholas JJ. Tobacco consumption and coronary artery disease. In: Rao GHR, Kakkar VV, eds. Coronary artery disease in South Asians. New Delhi: Jaypee Brothers, 2001: 147–64.
- Zaman MM, Yoshiike N, Rouf MA, et al. Cardiovascular risk factors: distribution and prevalence in a rural population of Bangladesh. *J Cardiovasc Risk* 2001; **8**: 103–08.
- Mendis S, Ekanayake EM. Prevalence of coronary heart disease and its risk factors in middle aged males in a defined population in central Sri Lanka. *Int J Cardiol* 1994; **46**: 135–42.
- Pandey MR, Neupane RP, Gautam A. Epidemiological study of tobacco smoking among adults in a rural community of the hill region of Nepal with special reference to attitudes and beliefs. *Int J Cardiol* 1988; **17**: 535–41.
- Haq MU, Haq K. Human Development in South Asia: crisis of Governance, 1999. Human Development 1 Center. Karachi: Oxford University Press, 1999.
- World Bank Report 2001: world development indicators. Washington: World Bank, 2001.
- Puska P, Tuomilehto J, Nissinen A, Vartiainen E, eds. The North Karelia Project: 20 years of results and experiences. Helsinki: Helsinki National Public Health Institute, 1995.
- Tinker H. A new system of slavery: the export of Indian labour overseas 1830–1920. London: Oxford University Press, 1974.
- McKeigue PM, Marmot MG. Mortality from coronary heart disease in Asian communities in London. *BMJ* 1988; **297**: 903.
- Klatsky AL, Tekawa I, Armstrong MA, Sidney S. The risk of hospitalization for ischaemic heart disease among Asian Americans in northern California. *Am J Public Health* 1994; **84**: 1672–75.
- Bhopal R, Unwin N, White M, et al. Heterogeneity of coronary heart disease risk factors in Indian, Pakistani, Bangladeshi and European origin populations: cross sectional study. *BMJ* 1999; **319**: 215–20.
- Riste L, Khan F, Cruickshank K. High prevalence of type 2 diabetes in all ethnic groups including Europeans in a British inner city. *Diabetes Care* 2001; **24**: 2–8.
- McKeigue PM, Shah B, Marmot MG. Relation of central obesity and insulin resistance with high diabetes prevalence and cardiovascular risk in South Asians. *Lancet* 1991; **337**: 382–86.
- McKeigue PM, Ferrie JE, Pierpoint T, Marmot MG. Association of early onset coronary heart disease in South Asian men with glucose intolerance and hyperinsulinaemia. *Circulation* 1993; **87**: 152–61.
- Zoratti R, Godsland IF, Chaturvedi N, Crook D, Stevenson JC, McKeigue PM. Relation of plasma lipids to insulin resistance, non-esterified fatty acid levels, and body fat in men from three ethnic groups: relevance to variation in risk of diabetes and coronary disease. *Metabolism* 2000; **49**: 245–52.
- Chambers JC, Shinichi E, Basset P, et al. C-reactive protein, insulin resistance, central obesity and coronary heart disease risk in Indian Asians from the United Kingdom compared to European whites. *Circulation* 2001; **104**: 145–50.
- Hoogeveen RC, Gambhir JK, Gambhir DS, et al. Evaluation of Lp(a) and other independent risk factors for CHD in Asian Indians and their USA counterparts. *J Lipid Res* 2001; **42**: 631–38.
- Bhatnagar D, Anand IS, Durrington PN, et al. Coronary risk factors in people from the Indian Subcontinent living in West London and their siblings in India. *Lancet* 1995; **345**: 405–09.
- Bhopal R. What is the risk of coronary heart disease in South Asians? a review of UK research. *J Public Health Med* 2000; **22**: 375–85.
- Singh RB, Mori H, Chen J, et al. Recommendations for the prevention of coronary artery disease in Asians: a scientific statement of the International College of Nutrition. *J Cardiovasc Risk* 1996; **3**: 489–94.
- Reddy KS. Hypertension control in developing countries: generic issues. *J Hum Hypertens* 1996; **10** (suppl 1): S33–38.
- Seidell JC. Obesity, insulin resistance and diabetes—a world wide epidemic. *Br J Nutr* 2000; **83** (suppl 1): S5–8.
- Squires WG Jr, Brandon TA, Zinkgraf S, et al. Hemodynamic effects of oral smokeless tobacco in dogs and young adults. *Prev Med* 1984; **13**: 195–206.
- Ramachandran A, Sathyamurthy I, Snehathala C, et al. Risk variables for coronary artery disease in Asian Indians. *Am J Cardiol* 2001; **87**: 267–71.
- Krishnaswami S, Prasad NK, Jose VJ. A study of lipid levels in Indian patients with coronary heart disease. *Int J Cardiol* 1989; **24**: 337–45.
- Heart Protection Study Collaborative Group. MRC/BHF Heart Protection Study of cholesterol lowering with simvastatin in 20 536 high-risk individuals: a randomised placebo-controlled trial. *Lancet* 2002; **360**: 7–22.
- Singh RB, Sharma JP, Rastogi V, et al. Prevalence of coronary artery disease and coronary risk factors in rural and urban populations of north India. *Eur Heart J* 1997; **18**: 1728–35.
- Nishtar S. Preventing coronary disease in south Asia. [heartfile.org/apend.htm](http://heartfile.org/apend.htm) (accessed Sept 12, 2002).