

Editorial: The cardiovascular disease epidemic: global, regional, local

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'The challenge of the cardiovascular disease epidemic is not whether it will occur at all in the developing countries but whether we respond in time to telescope the transition and avoid the huge burden in young and middle age adults. The question is not whether we can afford to invest in cardiovascular disease prevention in the developing countries, but whether we can afford not to' (Ruth Bonita).

This statement by the director for the surveillance of non-communicable diseases at the World Health Organization (WHO) forcefully summarizes critical issues related to cardiovascular disease (CVD) in developing countries: the upsurge of the CVD epidemic and the need for an urgent response to prevent an impending additional burden that can hardly be afforded by low and middle-income countries already plagued with scarce resources and a large burden of infectious diseases. Global-regional-local interrelations are central to these considerations. Globalization fuels the epidemic even to the remotest communities by spreading many unhealthy behaviours and environments conducive to CVD. However, globalization can also provide powerful means to tackle CVD at broad and local levels.

The rise in CVD in developing countries can be best understood in the light of the 'epidemiological transition' (Omran 1971; Reddy & Yusuf, 1998), an evolutionary framework linking demographical and social change to disease patterns. The rapid ageing of populations in developing countries is the first engine in the emergence of CVD. This demographic transition results from improved sanitation, nutrition and infectious disease control, particularly in childhood, which accompany urbanization and industrialization. Prolonged survival allows for longer exposure to CVD risk factors and this inevitably results in larger total numbers of CVD cases. In addition to ageing populations, industrialization and urbanization also bring about several changes in lifestyles such as sedentary habits, tobacco use and unfavourable dietary patterns, which

further increase the incidence of CVD and other chronic diseases. While the mix between specific chronic diseases in populations, particularly cerebrovascular disease and ischaemic heart disease, can differ substantially between developing countries, the shift from early transition diseases (infections and malnutrition) to late transition diseases (CVD and other chronic diseases) is rapid, large and consistent among most developing countries (Yusuf *et al.* 2001a, b).

It is not often appreciated that the current CVD burden in developing countries is already high. Approximately 78% of the burden of non-communicable diseases and 85% of the cardiovascular burden worldwide arose from the low- and middle-income countries in 1998 (WHO 1999). Furthermore, the CVD burden is expected to further increase significantly over the next decades. The combined morbidity and mortality burdens (expressed as disability-adjusted years of life lost) caused by ischaemic heart disease and cerebrovascular disease in developing countries are anticipated to rank first and fourth in 2020, compared with sixth and seventh in 1999 (WHO 2000a, b). It is also often not realized, possibly because of very high mortality rates from other diseases, that age-specific death rates from non-communicable diseases are higher in developing than developed countries (Murray & Lopez 1996). For example, the probability of stroke death is several folds higher, at all ages, in Tanzania than in the UK (Walker *et al.* 2000).

A number of factors could exacerbate the CVD epidemic in developing countries compared with its course in western countries. Urbanization in settings of poverty differs from that which occurs in prosperous economies, and the vulnerability to unhealthy behaviours is likely to be increased in a context of loose social network, stressful waged labour and restricted resources for public health response. This points to the higher prevalence of CVD and CVD risk factors among people of low socio-economic

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status – as we found for example in Tanzania (Bovet *et al.* 2002). An anthropological view suggests that high prevalence of some risk factors in population subgroups (e.g. hypertension in urban settings) can express a human maladaptation in an affluent society due to a dissonance between modern culture and the evolutionary legacy (i.e. an ‘acculturation’ process) (Dressler 1999). A gene–environment interaction has been postulated (the ‘thrifty genotype’ hypothesis) whereby CVD risk factors (e.g. obesity, diabetes, ‘diabesity’) would be the result of an evolutionary advantageous thrifty genotype that promotes fat deposition in times of plenty (Neel 1962). A foetal programming hypothesis postulates that intrauterine malnutrition (reflected by a low birth weight) leads to permanent biological structure and function changes that pre-dispose to CVD in adult life (Barker 1995).

Although the population-attributable importance of different risk factors can vary substantially between populations, the proximal causes of the CVD epidemics are qualitatively similar in all populations (van den Hoogen *et al.* 2000). Some major factors – physical inactivity, tobacco use and inappropriate diet (as expressed through unfavourable lipid levels, overweight and elevated blood pressure) – explain as much as 75% of the occurrence of CVD (Magnus & Beaglehole 2001). In the absence of these main risk factors, CVD is a rare cause of premature death (Stamler *et al.* 1999). Importantly, experience in a variety of populations has consistently demonstrated that lowering BP, blood cholesterol and quitting smoking greatly reduce CVD occurrence and numerous well-conducted trials have shown the importance of lifestyles and diet for improving risk factor levels and CVD outcomes (de Lorgeril *et al.* 1999; Sacks *et al.* 2001; Tuomilehto *et al.* 2001). From a strategic perspective, it must be recognized that interventions targeting only high-risk individuals (e.g. hypertensive or diabetic patients) will have very limited impact on the total CVD burden at the population level because most CVD cases in a population arise from the many individuals who have only moderately elevated risk factor levels – the so called ‘prevention paradox’ (Rose 1981). Population-wide intervention makes sense: it is estimated that a reduction in diastolic BP of only 3 mmHg in the entire population would reduce stroke deaths by about 1 million in the Asia/Pacific region by 2010 (Eastern Stroke and CHD Collaborative Research Group 1998). Overall, enough knowledge is now available for rational and effective prevention and control of CVD, even in developing countries (Beaglehole 2001).

The rapidly escalating prevalence of risk factors in many developing countries points to several detrimental effects of globalization. Globalization can be characterized by

intensified human interactions in a wide range of spheres (social, political, economic, environmental). The formidable spread of communication technologies has brought about an unprecedented flow of information across geographical, political and cultural boundaries via the mass media, advertising agencies and electronic channels. Unleashed trade liberalization has resulted in profound changes in consumption patterns worldwide, which parallel a concentration of the food production and expanded markets at an intercontinental scale. Remarkable examples of increased consumption of unhealthy products resulting from global marketing campaigns and trade liberalization include cigarettes, carbonated drinks (‘coca-colonization’) and cheap energy dense foods – the latter replacing locally produced low-fat and fibre-rich foods. In this respect, CVD can be appropriately considered as a *communicated disease*. By fuelling ‘vectors’ that can alter people’s lifestyles, particularly with regards to tobacco use and unhealthy dietary patterns, globalization is certainly an important factor for the increasing prevalence of overweight, high blood pressure, dyslipidaemia, type II diabetes, and ultimately CVD.

However, globalization also offers a range of potentially powerful opportunities for improving public health, including the prevention of CVD. On a general note, globalization can benefit health through improved economic growth and incomes, including the poor (Feachem 2001). More specifically, electronic information technologies permit expeditious and inexpensive dissemination of evidence-based knowledge to individuals, health professionals and policy-makers. This provides unprecedented opportunities for training in the remotest places and it facilitates network-building and information-sharing at regional, national or international levels. Global mechanisms can also be created to counter transnational political or economical influences. An example is the Framework Convention for Tobacco Control (FCTC), which is currently being drafted by the member states of the WHO. This legally binding international treaty will be a powerful global public health instrument for improving and harmonizing tobacco control measures and legislations in most countries. The ‘power of the process’ of negotiating this global treaty is already galvanizing new mechanisms of multisectoral collaboration at both national and continental levels. The influence of globalization on trade can also be positive. In Hungary, liberalization of trade in 1989 (alongside an unchanged health budget) resulted in substantially improved dietary patterns (e.g. fewer animal products and more fresh fruit and vegetables) that are believed to have largely accounted for the 25% decrease of the CVD mortality from 1989 to 1995 (Zatonski *et al.* 1998).

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What can be done to curb the rising CVD epidemic in developing countries?

The large contribution of the main risk factors to the CVD epidemic is well established and the need to reduce these risk factors is clearly a common goal of any prevention and control strategy. Generally, a dual approach is considered: screening and treatment of high-risk individuals while fostering population-wide preventive activities, starting in childhood, to reduce risk factor levels in the entire population. However, the appropriate mix in public health interventions and high-risk interventions is likely to differ widely between western and developing countries. Indeed, the CVD epidemic in western countries has largely relied on high-risk strategies (e.g. screening and treatment of hypertension, diabetes and dyslipidaemia) and clinical management of symptomatic CVD (e.g. coronary bypass, angioplasty). This predominant use of clinical approaches in western countries has taken place largely because the knowledge to tackle CVD has developed in parallel with the rise of the epidemic and because these wealthy countries could afford the considerable costs of such approaches.

In contrast, the CVD epidemic is still in its upswing in developing countries. Therefore, there is a window of opportunity for primary prevention in these countries. Primary prevention has not only the potential to decrease the number of new cases of CVD (i.e. to short-cut the epidemic) but interventions aimed at promoting healthy lifestyles among populations are also likely to necessitate far fewer resources. The cost of treatment for chronic diseases, from \$5–30 for the annual cost of the simplest antihypertension medication to > \$5000 for coronary revascularization, should indeed be weighed against the available resources. In low-income countries, health expenses can amount to as little as \$10–20 per head of population per year – memorably compared with the cost of a ‘meal at McDonald’s (Montgomery 1998) – against \$1000–4000 in western countries. These different constraints are also well illustrated by the actual number of cardiac surgery cases: less than 30 cardiac surgery cases per 1 million people in Africa and Asia compared with around 1000 cases per 1 million people in USA (Cox 2001).

The control of the CVD epidemic in developing countries should therefore rely largely on primary prevention, as emphasized in various policy documents (Chockalingam *et al.* 2000; WHO 2000a, b; Lenfant 2001; Nissinen *et al.* 2001; van der Sande *et al.* 2001). This includes, on one hand, community empowerment through mass and targeted education. Although there has been some controversy (Ebrahim & Davey Smith 1997), community-based education programmes can be effective provided they are

given at a sufficient dose and over enough time (Puska *et al.* 1998). Programmes must therefore be well-structured, integrated with other sectors, community-based, and well-funded. It should be examined whether community-based education programmes could be more effective in developing than in western countries, considering the limited information on healthy lifestyles from other sources in the South and the abundance of it in the North. On the other hand, educational, legislative, fiscal and environmental policies can provide an enabling environment conducive to the adoption of healthy lifestyles. Several policies can incur little cost and some (e.g. taxation of tobacco products) can even increase public revenues. Other policy measures can include the abolition of subsidies for the production of animal products, incentives to increase the availability and affordability of vegetable and fruit products, setting up mass sports facilities and recreational areas in urban settings to increase life-long physical activity, legislation and regulations to curb the use of tobacco products, the inclusion of health education programmes and physical exercise classes within the regular school curriculums, and measures to empower the vulnerable or particular subpopulations (e.g. improved participation of women in leisure physical activities). Policies at regional or local levels can also be highly relevant, e.g. for the preservation of traditional diets low in fat and rich in fibre in some areas or the consumption of fish in island and coastal communities.

While the key component for CVD control should clearly rely on the promotion of healthy lifestyles in the entire population, spending on CVD health care is unavoidable. In fact, a growing proportion of the health care sector’s meagre resources is likely to be used on control measures as the prevalence of CVD conditions increases in populations – e.g. the prevalence of hypertension among adults exceeds 20% of adults in many developing countries (Fuentes *et al.* 2000). A screening and treatment strategy in high-risk individuals is particularly costly: at least 50 hypertensive patients need to be treated yearlong to avoid one hypertensive death. However, failing to treat conditions that are both highly prevalent and amenable to treatment would imply lower value of human life in developing countries and is unacceptable on an ethical basis (Cooper *et al.* 1998). Hence, national and local policies must allow for targeted diagnosis and treatment of selected common CVD conditions amenable to cost-effective and affordable control. Allocation of resources towards this end should be based on cost-effectiveness and affordability criteria and in the light of a comprehensive assessment of competing health priorities. Diuretics and β -blockers for the treatment of hypertension and aspirin for the prevention of recurrent myocardial

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infarction are examples of therapies that are highly effective (reducing CVD risk by 20–40%) and fairly inexpensive (e.g. \$5–30 per year). Other highly effective medications (e.g. ACE inhibitors for hypertension and heart failure and statins for dyslipidaemias) may become eligible for broader use in some developing countries as they become off patent and expectedly less expensive. Some essential health care and low-priced medications for such CVD conditions should be available at primary health care level. By all means, the implementation of locally relevant high-risk interventions for CVD will call for the development of appropriate diagnosis and treatment guidelines, relevant training for health professionals, and the need to reform and reorganize health systems, inclusive by their financing mechanisms, to respond more effectively to the need of chronic diseases.

Two main challenges are to be recognized and addressed: the various constraints that limit the implementation of prevention and control measures and the need to build a supportive political will to effect the necessary policy changes.

Meaningful and well-presented data are needed for advocacy to policymakers, health professionals and the general public. This points to the paramount importance of surveillance systems in sentinel sites to monitor CVD risk factor levels in populations ('the risk factors of today are the diseases of tomorrow'). Noticeably, small-scale demonstration projects or ongoing disease-specific programmes (e.g. hypertension control programmes) can be conveniently used for advocacy and as entry points to more comprehensive programmes and policies. In practice, a main challenge in many developing countries is to build and maintain a critical mass of professionals and advocates who can advance the precept and practice of prevention and control of CVD and other non-communicable diseases.

Building political will for CVD prevention can be a difficult task in developing countries in view of other pressing problems and this process should clearly be a main component of any organized effort for tackling CVD. Political support is likely to be fostered if policymakers can be convinced that investment in health pays off (Jha *et al.* 2002; Sachs 2002). In view of the large impact of CVD on the health of economically active adults, on whom young and old members of the population are often dependent, investment in CVD prevention is likely to improve the productivity of the workforce, speed up economic growth and foster social stability. Inversely, ignoring non-communicable diseases in the health agenda of developing countries will inevitably lead to an increase in their burdens. A 'no-priority' approach would also allow the provision of health services for CVD to be largely

undirected by issues of cost effectiveness, and their treatment and prevention would be left to the mercy of local and global commercial interests (Unwin *et al.* 2001). Not only would such a 'no-priority' approach provide an ineffective response to the CVD epidemic but also it would ignore issues of equity in providing care for people with these conditions.

CVD prevention in the developing countries is necessary, feasible, and affordable. Now is the time to act.

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