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Cardiovascular disease in low- and middle-income countries: an urgent priority

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Cardiovascular disease burden in low- and middle-income countries (LMICs)

Cardiovascular disease (CVD) is a major global public health crisis, being responsible for 30% of worldwide deaths in 2008 (17 million deaths worldwide from an annual total of 57 million deaths) with an alarming 80% of these deaths occurring in LMICs (WHO 2011). Whilst effective measures are being put in place in high-income countries resulting in a decline in the rate of CVD (Ebrahim et al. 2013), CVD mortality is on a steady rise in LMICs with rates of up to 300–600 deaths attributed to CVD per 100,000 population, and is projected to increase causing preventable loss of lives (WHO 2011). This upsurge of the CVD epidemic poses an additional burden on the already over-burdened health care systems in these settings creating critical challenges to both national health systems and policy development which can impede the development of a strategic plan to address the CVD epidemic. The uncontrolled CVD epidemic is associated with increasing socio-economic costs with high levels of disability and loss of productivity, exacerbating poverty and increasing health inequalities. Accordingly, there is a pressing need to invest in CVD prevention as a major part of socio-economic development as the burden of non-communicable disease (NCD) will continue to rise in LMICs, disproportionately affecting the poor. The poor have the worst outcomes from NCDs, including CVD, largely because of their inability to access or afford preventative services and ongoing treatments. This calls for a more integrated approach for the detection, prevention and management of CVD in LMICs. In 2005 global health funding per death for HIV/AIDS was \$1029 compared with \$320 for NCDs (WHO 2005a), indicating that there is a widespread apathy with major health development funds, placing less emphasis in tackling NCDs in LMICs compared to other diseases. Thus, concerted global, regional and local partnerships are pivotal to address this silent epidemic. The United Nations General Assembly convened a high-level meeting on NCDs in New York in September 2011 to take action against this global epidemic. As a result the World Health Organization (WHO) was tasked with delivering a compelling agenda, now enshrined in the *WHO Global Action Plan for the Prevention and Control of NCDs* covering the period 2013–2020. Therefore national governments, policy-makers and international development partners have a key role in ensuring that CVD prevention and control becomes a major part of the health care development agenda.

CVD creates an enormous impact on socio-economic development due to societal and global determinants (Strong et al. 2005; WHO 2005a; Suhrcke et al. 2006) as many of those

in the high-risk group are at the peak of their productive and economic activity (Nugent 2008; Alwan and MacLean 2009; Alwan et al. 2010). These determinants include rapid globalisation, unplanned urbanisation, global trade and agricultural policies amongst other things, which ultimately influence an individual's or a society's ability to make healthy choices contributing to its negative impact on social and economic growth in LMICs (Lloyd-Williams et al. 2008). The economic impact in regard to loss of productive years of life and the need to divert scarce resources to tertiary care is substantial. CVD has a multifactorial aetiology with a number of potentially modifiable risk factors. Much of the population attributable risk of CVD is accountable on the basis of nine modifiable traditional risk factors, including smoking, history of hypertension or diabetes, obesity, unhealthy diet, lack of physical activity, excessive alcohol consumption, raised blood lipids and psychosocial factors (Gersh et al. 2010). Eight of these risk factors (excessive alcohol use, tobacco use, high blood pressure, high body mass index (BMI), high cholesterol, high blood glucose, dietary choices and physical inactivity) account for 61% of CVD deaths globally. About 84% of the total global burden of disease they cause occurs in LMICs, with studies showing that alleviating exposure to these eight risk factors would improve global life expectancy by almost five years (WHO 2005b, 2009). Thus further elucidation of the role of these risk factors is important for developing clear and effective strategies for improving global health.

Epidemiological transition

The increasing burden of CVD in LMICs can be largely explained by the epidemiologic transition theory which provided a useful evolutionary framework for understanding changes in disease patterns as a result of demographic factors (ageing and population growth) as well as socio-economic and behavioural changes such as the spread of Western diets and an increase in sedentary lifestyle (Omran 1971; Cappuccio 2004). This highlights that health risk factors are in transition, with an improvement in traditional risks which causes infectious diseases (possibly as a result of improvements in medical care and public health interventions such as vaccinations and the provision of clean water and sanitation targeted to reduce the incidence of infectious diseases). On the other hand factors like urbanisation, globalisation, westernisation and industrialisation result in the emergence of modern risks due to lifestyle changes (e.g. physical inactivity, obesity, other diet-related factors and smoking and alcohol-related risks) that are strong behavioural risk factors and increase the incidence and burden of CVDs in LMICs. The success in the fight against infectious diseases also results in a reduction of infant mortality rates and an increase in life expectancy, resulting in an ageing of the population, but changes in patterns of physical activity and food, alcohol and tobacco consumption predispose this ageing population to the risk of developing CVD. Prolonged survival allows for longer exposure to CVD risk factors and this inevitably results in larger total numbers of CVD cases (Danaei. 2011a, 2011b; Finucane et al. 2011). As a result, many LMICs are faced with a growing added burden from the modern risks factors which increase the incidence of CVD and other chronic NCDs whilst simultaneously dealing with the traditional risks of communicable diseases (known as 'double burden of disease'). Often there is no public health infrastructure or budget to address both communicable and NCDs such as CVD. Currently, these risk factors and measures to deal with the CVD and other chronic diseases epidemic are greatly influenced

by political, social, behavioural, environmental and economic determinants, stressing the need for an effective, consolidative multi-sectoral response to deal with the CVD epidemic and help promote socio-economic development in LMICs (WHO 2008).

How to prevent CVD in LMICs?

In most LMICs, awareness of CVD is low, due to technical, human, lack of infrastructure and financial resource constraints which are major impediments to the implementation of cost-effective CVD prevention and control programmes. The rates of detection and treatment of CVD and risk factors reported in many LMICs are critically low, and many people with these diseases have no access to appropriate health care. Lack of information and public awareness means late presentation of most NCD patients in LMICs, making treatment much more expensive. However, prevention and management of CVD risk have been shown to be cost-effective and affordable even in LMICs and should be the main intervention that should be adopted to address this pending epidemic. There is a need to determine disease burden and create awareness in communities on the dangers of CVD which will shift the conventional mode of addressing CVD from tertiary care to primary care and the community with emphasis on risk reduction. This will generate evidence and best practices for cost-effective and long-term community-based strategies for prevention and control of CVD risk factors, creating an effective treatment, lower costs of care and a reduction in the burden of CVD (WHO 2007). Thus intervention at the primary health care level for its prevention and management is a necessity for effective CVD control programmes in these settings at a national level (Reddy 2004). A number of key things must be addressed for an effective implementation of CVD control programmes, including the lack of research capacity, the poor infrastructure of the health care systems, the lack of research work focusing on CVD in these settings that would provide the evidence needed by health care decision-making policy-makers in LMICs to produce highly focused, quality assessed and policy-relevant summaries of research evidence in the field of CVD prevention, management and control. On the same note, government leaders are often slow or even reluctant to acknowledge the need for allocating adequate funding, without jeopardising current and future funding of the prevention and control of communicable diseases, to facilitate local evidence geared towards prevention and management of CVD at the population level. A strategic approach wherein effective primary intervention measures are developed, social, economic and environmental conditions and risk factors are addressed, best practices from other settings in the design of CVD prevention and control strategies are consulted by health policy-makers and evidence-based approaches for interventions for vulnerable groups and populations are adopted, would facilitate the achievement of a structured, integrated programme in CVD prevention (Institute of Medicine (US) Committee on Preventing the Global Epidemic of Cardiovascular Disease: Meeting the Challenges in Developing Countries 2010).

The importance of population-based approach through community-based interventions

As the burden of CVD in LMICs is projected to increase, it is essential to identify and evaluate current effective strategies implemented in CVD prevention and control programmes being adopted in LMICs as it might provide tools for new concerted prevention programmes in these settings. In this issue of the journal, van de Vijver et al. evaluated the effectiveness of community-based interventions for CVD prevention programmes in LMICs to assess their effectiveness of a population-based approach to CVD prevention. A review of the literature was carried out for community-based studies carried out in line with the American Heart Association Framework for public health practice for CVD prevention that were conducted between 1979 and 2008, and published between 1993 and 2011. A total of 26 population-based and high-risk population intervention studies were included (urban or mixed urban and rural setting), that compared intervention groups with non-intervention control groups, before and after the intervention on a number of behavioural outcomes (including tobacco and alcohol use, dietary habits, level of physical activity and salt intake), physical measurements (i.e. waist circumference, weight, systolic and/or diastolic blood pressure, hypertension and BMI), other biomarkers of risk (glucose and HbA1c levels) and the level of awareness, treatment and control of hypertension and diabetes. The outcome of each study was rated in terms of cost-effectiveness, feasibility and training on CVD prevention if this information was available. The aim of the study was to determine which community-based interventions were effective in reducing cardiovascular risk in LMICs at national and regional level. Health promotion using the media and health education as a platform at the national and regional level was mainly used in the population intervention studies, with the end goal of raising knowledge, awareness and healthy behaviour changes at different levels such as diet, exercise, smoking and alcohol use. On the other hand the high-risk population approach focused more on the education of patients, training of health care providers and the implementation of treatment guidelines. Five of these population-based interventions focused on modifying a specific CVD risk factor like salt reduction, healthier diets and exercising. In general, some studies showed a significant reduction of cardiovascular risk ranging from behavioural changes to outcomes like blood pressure, glucose levels or weight and an improved management of risk factors like increased control of hypertension or adherence to medication.

Important insights emerged from the present study. There are promising results from health education and health promotion through media; other means of communication, training of health care providers and the implementation of treatment guidelines, where feasible, are effective; follow-up and adherence are often barriers to an effective delivery of preventive strategies and may vary by age and gender; and several examples around the world confirm the feasibility of these approaches in LMICs. The various constraints that limit the implementation of effective CVD prevention and control measures and the lack of political backing and effective health policies are to be thoroughly addressed. The many challenges that LMICs face in implementing effective prevention and management programmes of CVD are not insurmountable, in preventing the epidemic from reaching its full potential with several affordable, adaptable and feasible multi-disciplinary interventions

for prevention being available for adoption in these settings. Major efforts must be made by key stakeholders to direct scarce resources to interventions that are cost-effective, culturally appropriate and sustainable. Accordingly these challenges could be addressed through comprehensive and sustainable approaches, incorporating health education awareness programmes through the media at the population level and implementing preventive measures with health care and treatment with a focus on diet and salt given the fact that they are largely associated with lifestyle factors, training health care staff and implementing treatment guidelines aimed to reduce the prevalence, enable early detection and provide appropriate care and treatment form key elements in successful programmes as shown by the conclusions of this review (van de Vijver et al. 2013). This is in agreement with other studies in the literature.

What to prioritise?

The most cost-effective interventions are tobacco control and salt reduction, and low-cost generic drugs for people at high risk of developing CVD, requiring community involvement for promoting access to services (Asaria et al. 2007). These interventions, if incorporated into population-based interventions, would avert 13.8 million deaths over 10 years in 23 LMICs (Asaria et al. 2007) and promote adherence to prevention protocols. Introducing treatment guidelines that are applicable to an LMIC setting and providing training for health care providers are also an important element in the fight against CVD. Accordingly, it is important to encourage and support active research in LMICs to produce data available to health policy-makers that would justify and increase the financial investments in CVD and possibly the re-evaluation of current health policies in place in LMICs or the development of new effective ones. Reducing salt intake at the population level, including reduction of salt levels in processed foods and food additives, and sustained public education to encourage change in food choices, is an easy way to implement, cost-effective method for preventing, managing and controlling CVD (Gomez and Cappuccio 2005; Cappuccio et al. 2006), making it a financially favourable intervention in LMICs. High salt intake has been shown to cause high blood pressure and to contribute to the incidence of strokes and other cardiovascular events (Strazzullo et al. 2009; Aburto et al. 2013), and a moderate reduction in population salt intake is estimated to lead to a 23% reduction in stroke rates (Cappuccio et al. 2011). It is an easily modifiable environmental factor and it is possible by nutritional education to reduce population blood pressure. This method is particularly effective in reducing the blood pressure of people of African descent as dietary salt is commonly added to the food during cooking or at table (Cappuccio et al. 2006).

These approaches, in turn, need to be underpinned by well-functioning health systems that are able to concurrently address both communicable and NCD. The health care infrastructure in these settings ought to be addressed and strengthened with the necessary political and community support to bring out the required health system reform, with effective monitoring and evaluation, and surveillance systems in place. It is quite evident in the literature that there is a gap in CVD research in LMICs compared to high-income countries (Ebrahim et al. 2013). The fragile research capacity, inadequate financial investment, the language barriers and the exclusion of journals edited in LMICs from a number of online resources are both a consequence and a contributory factor to the widening

gap between the health of high-income countries and LMICs, and indicate the need for research capacity building in all areas of NCD policy, advocacy, legislation and strategy (Mendis et al. 2003). Likewise local government and international health partnerships should build commitment, broaden awareness across governments and communities and address constraints faced by the health system. The quote below by the director for the surveillance of NCDs at the WHO forcefully summarises the critical issues related to CVD in LMICs.

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)

CVD prevention in LMICs is necessary, feasible and affordable. Clearly, the time has now come for action and implementation.

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