

EPIDEMIOLOGY, GLOBAL PUBLIC HEALTH; THE NEED FOR EQUITABLE ACTION TO ADDRESS CARDIOVASCULAR DISEASES

■ SHANTHI MENDIS

The magnitude of the cardiovascular disease burden

Cardiovascular diseases (CVD) are responsible for nearly 50% (17.3 million) of deaths due to noncommunicable diseases (NCDs) (Table) [1]. Out of the 17.3 million deaths, heart attacks and strokes account for 7.3 million and 6.2 million respectively. Projected estimates reveal that in 2030 coronary heart disease and cerebrovascular disease will continue to be the leading causes of the global disease burden [1]. Cardiovascular diseases once associated with affluence are now increasingly affecting low income groups due to the reversal of social gradients of risk factors including tobacco use [1–4]. Although almost 80% of the CVD burden is in low and middle income countries (LMIC) (Table 1) policy makers do not seem to give adequate attention to them, partly due to the unfortunate misconception that no affordable solutions are available.

Powerful global forces are shaping the health and disease profiles in the world. Ageing, rapid unplanned urbanization, and the globalization of unhealthy lifestyles such as tobacco use, unhealthy diet, inadequate physical activity and harmful alcohol use are increasing the prevalence of major metabolic risk factors; blood pressure, blood sugar and blood cholesterol. These risk factors are mostly asymptomatic. They are detected late only when they present to health facilities with complications such as heart attacks, strokes, heart failure, renal failure and amputations. This is the case particularly in disadvantaged groups who have inadequate access to health

DALYS	Low Income	Middle Income	High Income
Cardiovascular diseases	57,258	76,204	17,583
Cancer	18,982	40,975	17,826
Respiratory diseases	22,706	29,045	7,266
Diabetes	5,991	10,080	3,623

Table 1. The disease burden due to cardiovascular disease and other major noncommunicable diseases in high, middle and low income countries (DALYs thousands 2004).

care [5]. The resulting costs to individuals, families and the productivity of the society are high and are unacceptable but avoidable [5,6].

Developing countries have the greatest vulnerability and the least resilience. They have limited capacity to cope with CVD. Attention paid to CVD is minimal partly due to competing health priorities such as communicable diseases and maternal and child health that consume most of the meagre resources available for health care. Rising CVD trends also have a negative impact on poverty-reduction strategies as out of pocket expenditure and catastrophic costs of treatment for heart attacks, strokes and other complications drive many households below the poverty line each year. In addition, the fast growing CVD epidemic is also an impediment to economic development due to its impact on labour productivity and escalating public sector expenditure on health [7].

What needs to be done to address the cardiovascular epidemic?

There are evidence-based primary prevention interventions available to reduce behavioural and metabolic risk factors both at population and individual levels. They are cost effective and are applicable to LMIC [3,5,8]. Very cost-effective interventions are also available for prevention of recurrent cardiovascular events in those with disease [5,9]. All these interventions have been implemented effectively in many developed countries resulting in a downward trend in coronary heart disease mortality [10]. In developed countries, frameworks for addressing cardiovascular disease recognize the importance of prevention approaches and primary care as well as the contribution of the more specialized services. They offer a range of actions to help people so that they can avoid getting heart disease and stroke. In addition they provide high quality treatment and care for those who develop coronary heart disease or cerebrovascular disease including early diagnosis, prompt and effective ambulance and emergency services, high quality nursing, medical, surgical, specialist services including vascular surgery and rehabilitation.

Providing such a comprehensive framework is beyond the reach of LMIC due to limitations in resources, health systems and the health workforce. As a result, at present, many LMIC focus primarily or only on the care of acute cardiac or vascular events or complications of CVD. These patients usually have advanced disease that require sophisticated and costly technologies and treatment. Prevention and simple inexpensive interventions which can be implemented in primary care are thoroughly under-utilized. As a result of this short-sighted approach LMIC are experiencing upward spiralling of their health care budgets particularly due to hospital care.

The only lasting solution for the cardiovascular epidemic is one that is grounded in public health. Such an approach has to modify and monitor behavioural risk factors and determinants that lie outside the health sector. People have to be provided enabling environments and opportunities for healthy eating and physical activity [11]. Deterrents for tobacco use and harmful use of alcohol need to be embedded in policy actions such as banning of advertising and levying tax on these products [12,13]. In addition universal access to at least essential cardiovascular interventions needs to be ensured through a primary health care approach [5,14].

Global action and roadmap to address cardiovascular disease

The mandate of the World Health Organization is to strengthen the capacity of all countries to realize the full potential of CVD prevention and curtail unnecessary human suffering caused by disease through equitable and sustainable policies and disease control programs.

An action plan for implementation of a Global Strategy for prevention and control of NCDs including CVD was endorsed by the World Health Assembly in 2008 [2,4]. It provides a roadmap for the work of the World Health Organization, its Member States and international partners. The six main objectives and progress in the implementation of the Global Action Plan are outlined below.

Objective 1. Embedding NCD/CVD prevention in the development agenda, and in policies across all government departments.

The World Health Organization (WHO) is joining efforts with all partners to get NCD/CVD on the global health and development agenda. Regional Ministerial Meetings were held in Beijing, in April 2009 and in Qatar, in May 2009. At the latter meeting the Doha Declaration was issued which called for 'raising the priority accorded to NCDs on the agendas of relevant high level meetings of national, regional, and international leaders'. The Economic and Social Commission (ECOSOC) Ministerial Roundtable Meeting on NCDs was held at the ECOSOC High-level Segment on Global Health held in Geneva in July 2009. In addition, at the Commonwealth Heads of Government Meeting in Trinidad and Tobago in November 2009, a statement was issued on Commonwealth Action to combat NCDs.

More recently, the United Nations General Assembly Resolution A/RES/64/265 was adopted in May 2010, which calls for specific actions to address NCDs including convening a high-level meeting of the General Assembly in September 2011, with the participation of Heads of State and Government. The UN resolution further requests the Secretary-General to

submit a report to the General Assembly at its sixty-fifth session in collaboration with Member States, the World Health Organization and the relevant funds, programmes and specialized agencies of the United Nations system, on the global status of NCDs, with a particular focus on the developmental challenges faced by developing countries.

Objective 2. Establishing and strengthening national policies and programmes

WHO is promoting integrated NCD policy frameworks in alignment with national health strategies. National programs with performance targets are been established under these overarching policy frameworks for monitoring of risk factors, early assessment of cardiovascular risk and management of CVD/NCDs. A package of essential NCD interventions and the Global Price Tag for its implementation are been developed.

Objective 3. Reducing and preventing risk factors

Prevention of behavioural risk factors is a public health priority reflected in the global public health instruments such as the Framework Convention on Tobacco Control (FCTC) [11] and global strategies for Diet, Physical Activity and Health [12] and against the harmful use of alcohol [13]. They call for appropriate policy actions and intersectoral approaches to curb the rising trends in tobacco and alcohol use and obesity. The WHO Framework Convention on Tobacco Control (WHO FCTC) [12] is a regulatory strategy to reduce the demand for tobacco (through price, tax and other measures) and to address supply issues such as illicit trade, sales to minors, and economically viable alternatives to tobacco. The WHO FCTC has 168 Signatories and many countries have shown good progress in tobacco control through its implementation.

There is strong evidence of the link between intake of *trans* fat, high salt consumption, low consumption of fruits and vegetables and CVD [12]. Strategies to reduce population-wide salt and *trans* fat intake are cost-effective and applicable worldwide [12,2,4]. The average daily salt consumption in most populations exceeds recommended amounts [15]. WHO is providing guidance to Member States to interact and negotiate with food manufacturers to reduce salt in processed food. Many developed countries are actively pursuing policies for reducing consumption of industrially produced *trans* fat and salt [15,16].

Objective 4. Prioritizing research on prevention and health care

There is a clear need for bridging gaps in knowledge about what works in NCD prevention and control. A prioritized research agenda which addresses

the priority needs of CVD prevention and control will be finalized in 2010 [17]. The aim is to provide guidance to developing countries on implementation research for effective translation of already available scientific evidence.

Objective 5. Strengthening partnerships

The recently established global NCD network (NCD net) and NCD alliance have facilitated partnership processes across diseases linking CVD advocates with their colleagues from cancer, diabetes and lung diseases, to jointly be more effective. The main goals of the network are to promote innovative resource mobilization and strengthen country capacity for implementation of the global NCD action plan.

Objective 6. Monitoring

Accurate data on CVD risk factors and mortality are not available in a significant number of LMIC. Reliable information on NCD mortality and risk factors are required to measure trends in risk factors and diseases and also as a yardstick for evaluating the impact of national NCD/CVD programs. Country capacity is being strengthened to collect information on a few reliable indicators that can be accurately measured over time through institutionalization of monitoring and evaluation programs. This is essential for accountability of all stakeholders.

Primary prevention of coronary heart disease and cerebrovascular disease

Prevention is the most sustainable solution for CVD, particularly in LMIC. However, most countries invest very little on prevention as the results of prevention are not immediately visible.

Primary prevention should receive the highest priority, because of the high case fatality and debilitating outcomes of heart disease and stroke [8]. There are two complimentary approaches for primary prevention of CVD which have synergistic effects: a) Population-wide approaches to reduce risk factors (tobacco use, unhealthy diet, physical inactivity and harmful use of alcohol). These public health programs will have the best chances of success if they are part of a coordinated prevention effort to address major NCDs, under the stewardship of the Ministry of Health. b) Approaches for early detection and management of those at high cardiovascular (stroke) risk. Population-wide primary prevention has been shown to be very cost-effective. Early detection and care of those at high risk of heart disease and stroke is also cost-effective and affordable to LMIC when a total risk approach is used for treatment decisions [3,8]. This calls for a paradigm shift from vertical programs targeting single risk factors which are not cost-ef-

fective, to a total risk approach. Risk stratification can be based on risk factors that are measurable in low resources settings e.g. age, gender, tobacco use, blood pressure, blood glucose and blood cholesterol [18]. WHO has developed WHO/ISH risk prediction charts to enable this approach to be implemented worldwide.

Population-wide interventions alluded to above are highly cost-effective and include tobacco control and actions to promote a healthy diet and physical activity [3,8,9]. WHO's Framework Convention on Tobacco Control [11] and the Global Strategy for diet, physical activity and health [12] provide guidance to countries on tobacco control and life course action related to diet and physical activity. These prevention activities also prevent other major NCDs; cancer, diabetes and respiratory disease and need to be implemented in a coherent and coordinated manner within and overarching national NCD policy [19].

Primary prevention interventions targeting individuals include pharmacological and nonpharmacological interventions to lower cardiovascular risk through tobacco cessation, blood pressure, blood sugar and cholesterol lowering agents [8]. These evidence-based interventions are cost-effective particularly when targeted at high risk groups. Even in primary care settings in LMIC risk prediction charts with simple variables can be used for risk stratification and provision of treatment based on the degree of risk [5].

Acute care and secondary prevention of CVD

Evidence-based interventions are available for reducing complications and mortality from transient ischemic attack, unstable angina, acute myocardial infarction and stroke. These interventions are not accessible to many in LMIC due to limitations in the health systems.

Same is true for secondary prevention measures which are effective in reducing recurrent heart attacks and strokes [9]. All people with suspected TIA or unstable angina need referral for specialist care.

Challenges to prevention and management of CVD in LMIC

What should be done to address the CVD epidemic is clear, based on available research evidence and lessons learned in developed countries. However, more work is required to have clarity on *how* it should be done in order to overcome multiple challenges that are the reality in LMICs. There are many causes for these complex challenges. They include resource constraints, competing public health priorities (communicable diseases, maternal and child health, HIV/AIDS, disasters and emergencies, and violence and injuries) and limited capacity of the health workforce and the health

systems. In this context-innovative and context-specific approaches are required for application of *what is known*. As there are no short-term solutions to CVD, long-term sustainability and affordability of programs should be prime concerns in establishing CVD programs in LMIC. Sustainability could be best achieved through domestic capacity strengthening, domestic investment, integration of CVD programs within overarching NCD frameworks and institutionalization.

Health workforce need to trained to develop skills and competence to deliver quality health care. In addition the capacity of Ministries of Health need strengthening. In many developing countries there is only one focal person to address NCDs, whereas Ministries require a multidisciplinary team for this purpose. The composition of the team needs to be such that there is a skill-mix for a range of functions required for NCD prevention and control including policy formulation, implementation, intersectoral collaboration, regulation, legislation, advocacy, partnerships and monitoring and evaluation.

The majority of people in LMIC have no health insurance and spend out of pocket for health [14]. In such settings strokes and heart attacks result in loss of employment as well as catastrophic spending on health care. Acute care of cardiovascular events requires early identification of eligible patients by health care workers and their urgent transfer to expert treatment centers. Thrombolysis, if indicated, and aggressive supportive care need to be provided in emergency care units. These centers also need to offer imaging, admission to a cardiac or stroke care unit, and access to a specialist. Many LMIC are ill-equipped to provide such care. Further, many people die before they ever get to a hospital due to difficulties of access and lack of organized ambulance and paramedical services. Thrombolytic therapy is costly and is unaffordable to the majority who are uninsured. Even if thrombolytic therapy and acute coronary and stroke care is made available at public costs, most patients seen in emergency departments in LMIC are unlikely to be eligible for thrombolysis because of delay in seeking care due to lack of awareness or lack of access [20]. In addition, lack of trained staff, poor access to imaging facilities and shortage of public health sector funds make it difficult to provide these services on a national scale in LMIC [21].

Feasible approaches for prevention and management of CVD in LMIC

The realities alluded to above that prevail in LMIC reiterate the urgent need for affordable prevention and control of heart attacks and stroke. Emphasis needs to be given to upstream public policy measures for prevention, population (school, community and worksite) based prevention programs,

intersectoral collaboration to create conducive policy and environment for behaviour change, ensuring consumer access to information, early diagnosis at first contact level, improving clinical practice patterns in primary care, strengthening provider and patient communication and promoting self-care.

The public need education on how to reduce the risk of CVD and on the importance of seeking prompt medical attention for CVD events and on self-care. Medical and health worker curricula need to be modified so that doctors and other health workers are trained and made aware of the importance of correct diagnosis, timely referral and evidence based-primary and secondary prevention of CVD.

Acute coronary and stroke care delivered by trained multidisciplinary teams in dedicated units may be too costly for wide implementation in LMIC. Other models need to be explored including 'mobile cardiac and stroke services' with multidisciplinary teams that manage heart attack and stroke patients in different wards in hospitals, provision of 'care' in medical wards by general physicians and their teams and telemedicine approaches.

Prevention and treatment of strokes and heart attacks require integrated programs in primary care. The metabolic risk factors, raised blood pressure, raised blood sugar and raised blood cholesterol are common to vascular disease of different vascular territories; stroke, coronary heart disease and peripheral vascular disease. Programs for primary and secondary prevention of these diseases can therefore be integrated into primary care [5]. Risk stratification, primary prevention and prevention of recurrences, are feasible, in primary care, even in LMIC [5,22]. Primary care workers can also be trained to detect and diagnose acute coronary syndromes, transient ischemic attacks and strokes, provide urgent treatment and refer for specialist assessment.

The use of multidisciplinary teams to implement a chronic care model as is done in some developed countries, is beyond the resources of most low income countries. Context specific service delivery models need to be developed to engage communities and to prioritize actions to suit local needs.

Given the social gradient of CVD, special attention is required to identify and rectify factors that increase vulnerability, exposure to risk and poor cardiovascular outcomes of disadvantaged segments of the population [23]. Explicit action is needed to address social inequalities in behavioural risk factors and access to and utilization of health services.

Conclusion

Programs for prevention and control of CVD in LMIC need to be integrated with the national NCD program and linked to the national health plan and strategy.

The key components of a national CVD program include:

1. A national CVD program within an overarching national NCD policy framework;
2. Survey of cardiovascular risk factors and a risk factor surveillance system institutionalised within the national health surveillance system;
3. A CVD prevention service integrated with NCD prevention focusing on implementation of the FCTC and initiatives for reduction of salt and elimination of *transfat* in processed foods;
4. School, worksite and community health programs to reduce risk factor levels by making structural changes and establishing incentives to promote physical activity and a healthy diet (e.g. intake of fruits and vegetables and reduction of salt and saturated fat);
5. Integrate evidence-based and cost-effective primary and secondary prevention interventions into primary care as part of a core set of NCD interventions
6. Early detection of high risk people in worksites and communities using easily measurable risk factors and risk stratification systems;
7. Public education campaigns to create awareness of risk factors of heart attacks and stroke and symptoms of acute coronary events, TIA and stroke;
8. Evidence-based clinical practice for management of people with high cardiovascular risk, acute coronary syndromes, angina, TIA, acute stroke and cardiac and stroke rehabilitation;
9. Strengthened capacity in acute coronary and stroke care and stroke rehabilitation services;
10. Assessment (and modification) of the impact of government policies on CVD and NCDs, e.g. policies related to transport, trade, finance, education and sports, agriculture and food.

Finally, health including cardiovascular health is a right of every human being and not a commodity to be bought, sold or provided merely on a charitable basis. In this context human rights implications of health and non-health sector policies require scrutiny. Government policies of all sectors need to be health promoting and not damaging to health, particularly to population groups considered most vulnerable in society, e.g. children, elderly and the poor.

The ingredients of a right-based approach to health are well recognized. Yet, in the area of CVD/NCDs human rights are violated on a daily basis, e.g. health damaging products are sold to minors and the illiterate while multinational companies make unethical profits and sick people are left to

die because they do not have access to essential CVD interventions and medicines [24]. Governments, development agencies, international organizations, religious establishments, the private sector and commercial entities have an obligation to act to alleviate this situation.

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