COMMUNICATION: PLENARY TALK

Developing a Strategy for Cardiovascular Disease: Surveillance, Prevention and Healthcare

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ABSTRACT

Received 17 February 2014
Accepted 20 February 2014

Introduction Cardiovascular diseases are a major component of non-communicable diseases and include coronary heart disease, stroke and peripheral vascular disease. Public health strategies to address cardiovascular disease require three elements: surveillance, health promotion, and individual health care.

Methods Surveillance includes monitoring of mortality and morbidity as well as surveys to monitor risk factors levels in the community. Data on mortality from cardiovascular diseases are readily available and analysed by age and sex specific rates looking are secular trends, geographical and ethnical group variations and international comparisons. However many deaths from cardiovascular disease occur suddenly and the cause of death may be registered without autopsy or any other validation. Cardiovascular morbidity information is more difficult to collate and interpret as it is closely related to availability and access to health care. Periodic surveys of cardiovascular risk factors are essential in monitoring the underlying trends in blood pressure, smoking, cholesterol, obesity, and diabetes as they predict future trends, and support planning for prevention and healthcare.

Results Prevention and health promotion activities are informed by the levels and trends in cardiovascular disease and its risk factors. There has been debate about population health promotion and individual health care strategies, but both are necessary. Cigarette smoking, nutrition and physical exercise are the main behaviours to be addressed but these are complex and require multifaceted approaches. Education alone is insufficient to change health behaviours and health promotion needs to look to changing attitudes. Legislation, taxation and other fiscal interventions have been shown to be effective however these can be difficult for legislators as there are other competing interests, particularly in the area of nutrition and tobacco. Creating health promoting environments that make healthy behaviour choices easier can be beneficial.

Conclusions Health care interventions are also effective in reducing the burden of cardiovascular disease. A balanced approach of health promotion and individual health care is recommended in the development of a strategy for cardiovascular disease.

Keywords Cardiovascular disease - Non-communicable disease - Public health.

INTRODUCTION

Cardiovascular diseases are a major component of non-communicable diseases and include coronary heart disease, stroke and peripheral vascular disease. There is a long history of cardiovascular diseases in high income countries with western cultures over the last 100 years where they have become the most common cause of mortality. However cardiovascular diseases are increasingly common globally and have become a major threat to health in low and middle income countries. Non-communicable diseases were not included in the Millennium Development Goals of 2000 which focussed on the communicable diseases of HIV/Aids, tuberculosis and malaria. It is now recognised that nearly 80% of deaths from non-communicable diseases occur in low and middle income countries [1].

Cardiovascular diseases include coronary heart disease, stroke, and peripheral vascular disease. Coronary heart disease presents as a number of clinical entities such as acute myocardial infarction, angina pectoris, heart failure, arrhythmias and sudden death. Cardiovascular diseases are not only a major cause of mortality but also of morbidity; they are responsible for loss of productivity, and have an impact on the economy as well as on the individual and their families. They result in residual disability and have a considerable impact on the health services.

National strategies to address cardiovascular diseases overlap with strategies for non-communicable diseases as there are several risk factors in common including diet, physical activities and tobacco smoking[1]. This paper aims to describe the public health strategy needed to address cardiovascular disease which needs three elements: surveillance, prevention and health promotion, and individual health care.

Surveillance

Surveillance includes monitoring of mortality, morbidity and use of health services as well as regular surveys of risk factors.

i) Mortality

Data on mortality from cardiovascular diseases are readily available and are normally analysed by age and sex specific rates looking at secular trends, geographical and ethnic group variations and international comparisons. Many deaths from cardiovascular disease occur suddenly and the cause of death may be registered without autopsy or any other validation. In some settings registration of cause of death may not be complete. There may also be regional variations as well as secular trends in how diseases are defined and classified and periodic changes are made in the International Classification of Diseases. However, despite these limitations, there is value in reviewing the data on cardiovascular disease mortality rates. Figure 1 shows the standardised death rates from cardiovascular mortality and diabetes in 2008 for a number of selected countries[2]. Traditionally cardiovascular diseases have been characteristic of western cultures with high rates in North America and in Europe, especially Scotland and Finland[3]. However there have been very considerable declines in cardiovascular disease death rates in Europe over the last 25 years, for example declines of 54% in Finland and over 60% in UK, Ireland and Sweden[4]. In contrast there have been substantial increases in the Commonwealth of Independent States such as Belarus and Ukraine, and in East Asia. The rise in non-communicable diseases including cardiovascular diseases in some former Soviet Union areas has resulted in a decrease in life expectancy[5]. These death rates in middle and lower income countries are projected to rise by over 50% by 2030. The death rate from cardiovascular diseases and diabetes in Malaysia is now much higher than Europe, USA and Australia in both men and women.

ii) Morbidity

Cardiovascular morbidity information is more difficult to collate and interpret than cardiovascular mortality data. Accurate incidence data on cardiovascular events require disease registers, robust diagnostic criteria, and completeness of ascertainment all of which is challenging for many health systems. International studies such as the WHO MONICA project have measured incidence in selected populations within countries[6]. Prevalence at one point in time can be measured in prevalence surveys of risk risks in population samples. Prevalence of chronic manifestations such as angina pectoris and claudication can be estimated by prevalence surveys, however it is important that standardised, validated methods are used which allow international comparisons and assessment of trends over time[6].

iii) Risk Factors

Periodic surveys of cardiovascular risk factors are essential in monitoring the underlying trends in blood pressure, smoking, cholesterol, obesity, and diabetes. Levels and trends in disease and its risk factors are important intelligence in predicting future trends, and planning prevention programmes. Current risk factor trend analysis in Malaysia show adverse trends for blood pressure, fasting blood glucose, total cholesterol and body mass index[7]. WHO has developed a framework for monitoring non-communicable diseases and their risk factors[4] and has developed the STEPS approach[8] to develop comprehensive risk profiles at a national level.

The age standardised adjusted estimates for current daily tobacco smoking for the same selected countries are shown in Figure 2[6]. The figure shows a relationship between male smoking and death rates from cardiovascular disease and diabetes in men shown in Figure 1. With the exceptions of Saudi Arabia and the Republic of South Africa the countries with high mortality are also the countries with a high prevalence of tobacco smoking. However the European countries previously had similarly high levels of tobacco use which have now decreased while the trend has been increasing in Asia countries. The pattern of women smoking in Europe tends to be similar to the pattern in men while in Asia the uptake of smoking by women has remained low, it is important that this is maintained.

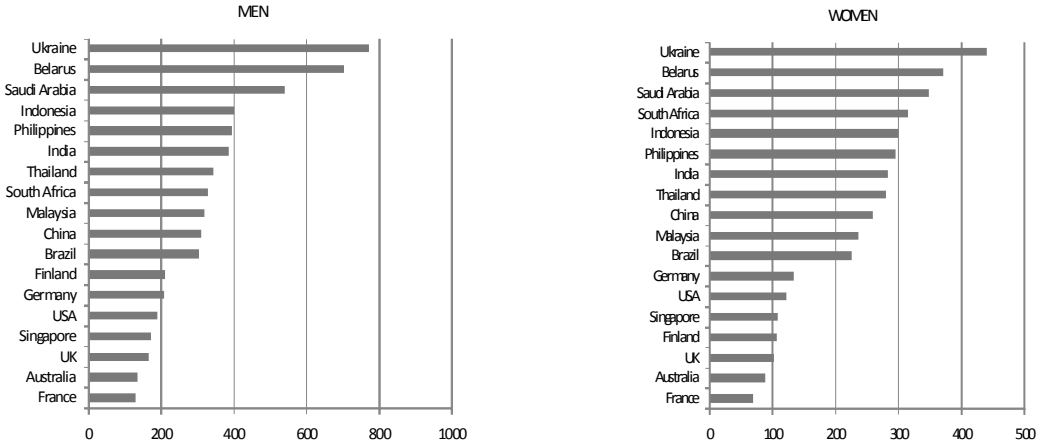

Figure 1 Age Standardized Death Rates per 100,000 from Cardiovascular Disease and Diabetes (2008)
Source: WHO 2010[2]

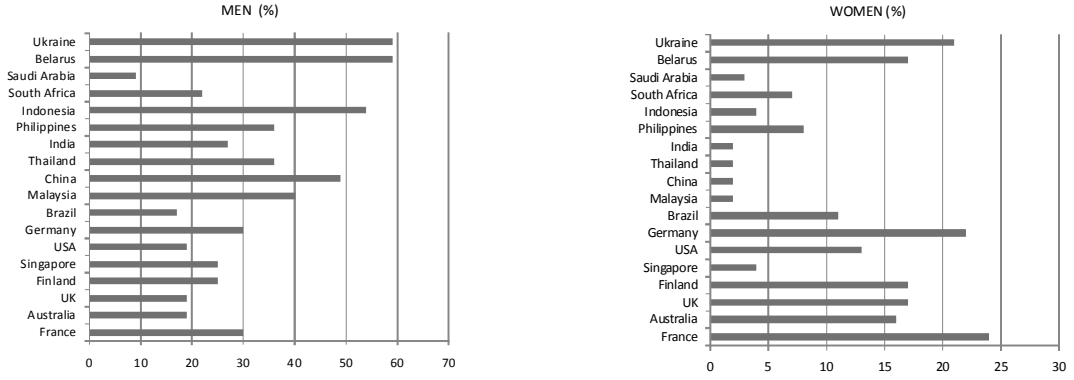

Figure 2 Ages Standardized Adjusted Estimates of Current Daily Tobacco Smoking
Source: WHO 2010[2]

In 2011, similar health and morbidity surveys were conducted in both Malaysia and Scotland[9,10]. The similarities and differences are interesting and these are presented in Table 1. The proportions of the populations with hypertension are similar but over 60% of those in Malaysia are undetected while only 17% in Scotland are untreated. Earlier surveys in Scotland had shown high levels of under-diagnosis and under-treatment hypertension but the detection and management of hypertension has now greatly improved[11]. The proportion with diabetes in Malaysia is around double that in Scotland but over half of those in Malaysia are undetected while the figure in Scotland is 30%. The differences in diabetes are not explained by differences in Body Mass Indices (BMI) since in Scotland 64% have BMIs of 25 Kg/m^2 or more compared to 45% in Malaysia. Other factors such genetics and nutrition is clearly important and this observation has been investigated in previous surveys[12]. Successive surveys in Malaysia have shown increasing proportions of the population with diabetes[9].

Table 1 Disease prevalence in adults: results from Health Surveys in Malaysia and Scotland (2011)

	Men	Women	Undetected
Hypertension			
Malaysia	34%	32%	61%
Scotland	33%	32%	17% (Untreated)
Diabetes			
Malaysia	15.8%	14.6%	53%
Scotland	8.7%	7.0%	30%

Hypertension: Self reported plus average blood pressures equal or greater than 140/90 mmHg
Diabetes: Self reported plus fasting blood glucose (Malaysia) and glycated haemoglobin (Scotland)
Source: References[9, 10]

iv) Health systems response
Information on the use of health services such as admissions for coronary syndromes, prescribing of cardiovascular drugs and interventions such angioplasty can be used to assess cardiovascular morbidity. These data are difficult to interpret as they are closely related to availability and access to health care and may not reflect need. However such information has value for the planning of health services and for monitoring their uptake reflecting demand and access to healthcare.

Prevention and Health Promotion
Prevention of non-communicable diseases including cardiovascular diseases is an important political issue[13] and this is reflected in the WHO – Malaysia country cooperation strategy 2009-2013[14]. The focus of prevention and health promotion activities is based on the data on the levels and trends in cardiovascular disease and its risk factors. There has been debate about population health promotion and individual health care strategies, but is clear both are necessary. Cigarette smoking, nutrition and physical exercise are the main behaviours to be addressed but these are complex and require multifaceted approaches. Education alone is insufficient to change health behaviours and health promotion needs to look to changing attitudes. Legislation, taxation and other fiscal interventions have been shown to be effective however these can be difficult for legislators as there are other competing interests, particularly in the area of nutrition and tobacco. The banning of smoking in public areas has been widely accepted however it is only one step in a long battle. Countries trying implement minimum pricing on alcohol and advertising bans face many legal and political challenges[15]. Creating health promoting environments that make healthy behaviour choices easier can be beneficial, particularly related to smoking bans and opportunities for physical exercise. Health promotion actions can target specific groups such as schools, occupational settings and hard to reach groups such as young adults.

i) Multi-sectoral approach
The impact of cardiovascular diseases and diabetes is not just on the health of individuals and populations but also impacts on the economy through reduced productivity, and increased costs of health care. It is therefore important that multisectoral approaches are employed in the prevention of cardiovascular disease[16]. The approaches involve not only the health care sector but also education, agriculture, the environment, transport, urban planning, leisure and recreation and industry.

ii) Legislation and Fiscal approaches
Legislation and fiscal measures are important in the control of tobacco and alcohol use through age restrictions, restrictions on sales, use in public places, taxation, protecting people from secondary smoke, health warnings and bans on advertising These approaches can be extended to unhealthy diets and physical inactivity through legislation, taxation on unhealthy foods, food labelling and subsidies on healthy foods[17]. Legal controls on emissions to reduce air pollution can also have a benefit for cardiovascular health.

iii) Education and Information
Education and information are important aspects of prevention and health promotion but need to be supported by legislation, fiscal measures and the promotion of environments making healthy choices easier. This includes education through the curricula for schools and colleges but also approaches to the wider community through the media such as newspapers, radio and television.

iv) Behaviour change
Changing behaviour in the use of tobacco, alcohol, diet, and physical activity is a complex process. Education is part of the process but creating healthy environments, pricing, taxation, and legislation are all important in encouraging healthy behaviour. Support such as help to quit tobacco use is a specific example[5].

Healthcare

There has been debate over whether health promotion or individual health care interventions are more effective in reducing the burden of cardiovascular disease. Clearly both are important and the dilemma has been over which has the greatest contribution and which is more cost-effective. In practice the urgency of clinical need has tended to favour funding individual health care but it is important that health promotion interventions are also resourced and pursued vigorously. Acute coronary and stroke care, while increasingly effective, are expensive. Management of high risk patients and secondary prevention is also effective as is management of diabetes and individual measures to support smoking cessation. A balanced approach of health promotion and individual health care is recommended.

Management of risk factors

Primary prevention relates to management of risk factors in healthy individuals such as treating hypertension or raised blood cholesterol. This usually requires some form of screening such as population screening, occupational screening, or opportunistic screenings when a patient consults about other health problems. There is debate about the cost-effectiveness of screening and treating healthy individuals with a single risk factor because of their low absolute risk. Approaches using multiple risk factor scores have been advocated to identify individuals at higher risk of cardiovascular diseases[18].

i) Secondary prevention

The evidence of effectiveness of interventions to reduce risk in people with existing cardiovascular disease is substantial. Interventions include behavioural changes such as smoking cessation, dietary change, weight management and increase in physical activities which are cost effective. Management of related co-morbid condition such as diabetes and hypertension have benefits. There are also effective pharmacological interventions that reduce risk of further events such as aspirin, cholesterol lowering agents, ACE Inhibitors and beta-blockers. Influenza vaccination and cardiac rehabilitation also have health benefits. These interventions are important as they are cost-effective in identified individuals who are at increased risk[19].

ii) Acute care

In the past there has been debate about the relative impact of prevention versus treatment on cardiovascular disease mortality and morbidity rates. An analysis of decreases in cardiovascular disease mortality rates in the United States between 1980 and 2000 estimated that half of the decrease was attributable to changes in risk factors and half due to medical intervention[20]. There have been rapid developments in the management of acute coronary syndromes as well as management of acute stroke in specialised stroke units which have resulted in reduced mortality and increased survival and quality of life. A balanced strategy for cardiovascular disease must include the health care but consideration needs to be paid to the cost-effectiveness of the different interventions and the cost impact on individuals and health care providers.

CONCLUSIONS

A strategy to address cardiovascular diseases requires surveillance, prevention/health promotion, and health care components. Surveillance includes monitoring trends in cardiovascular diseases as well as trends in cardiovascular disease risk factors. The trends in modifiable cardiovascular disease risk factors in many Asia countries including Malaysia show adverse trends in hypertension, diabetes, obesity, tobacco smoking, and physical inactivity. These risk factors trends are a prelude to further includes in cardiovascular morbidity and mortality, such increases can impact on the economy, life expectancy, as well as the health individuals. A strategy of managing the increase by health care alone is unaffordable and unsustainable. A balance strategy must include multi-sectoral approaches to health promotion and disease prevention to reverse the trends in cardiovascular disease.

ACKNOWLEDGEMENTS

The paper is based on a plenary presentation at the 3rd International Public Health Conference in Kuching, Malaysia in August, 2013.

REFERENCES

1. World Health Organisation. 2008-2013. Action Plan for the Global Strategy for the Prevention and Control of Non-communicable Diseases. World Health Organisation, Geneva; 2008.
2. World Health Organisation. Global Status Report: Non-Communicable Diseases 2010. World Health Organisation, Geneva; 2011.
3. Smith W C S, Tunstall-Pedoe H D. European regional variations in cardiovascular mortality. Br Med Bull. 1984; 40: 374-379.
4. Nichols M, Townsend N, Scarborough P, Rayner M. Trends in age-specific coronary disease mortality in the European Union over three decades: 1980-2009. European Heart Journal. Available from: doi:10.1093/eurheart/eht159.

5. World Bank. The growing danger of non-communicable diseases. World Bank. 2011 Sept.
6. MONICA. World's largest study of heart disease, stroke, risk factors and population trends 1979-2002. World health organization, Geneva; 2003.
7. World Health Organisation. NCD Country profiles: Malaysia. World Health Organisation, 2011.
8. World Health Organisation. STEPwise approach to surveillance (STEPS) [Internet]. [cited 2014 Feb 10] Available from: http://www.who.int/chp/steps/en/
9. Institute of Public Health. National Health and Morbidity Survey 2011 (NHMS 4). Ministry of Health, Malaysia; 2013.
10. Scottish Health Survey. The Scottish Health Survey 2011. Scottish Government, Edinburgh; 2012.
11. Smith W C S, Lee A J, Crombie I K, Tunstall-Pedoe H D. Control of blood in Scotland - the rule of halves. Br Med J. 1990; 1: 981-983.
12. Letchuman GR, Wan Nazaimoon WM, Wan Mohamad WB et al. Prevalence of diabetes in the Malaysian National Health Morbidity Survey III 2006. Med J Malaysia. 2010; 65:173-179.
13. Geneau R, Stuckler D, Stachenko S et al. Raising the priority of preventing chronic diseases: a political process. Lancet. 2010; 376:1689-1698.
14. World Health Organisation. Malaysia: country cooperation strategy 2009-2013. World Health Organisation, Geneva; 2010
15. Gornall J. Scotland's battle over alcohol pricing. Br Med J. 2014; 348:15-17.
16. Lock K, Smith RD, Dangour AD et al. Health, agricultural and economic effect of adoption of healthy diet recommendations. Lancet. 2010; 376:1699-1709.
17. Cecchini M, Sassi F, Lauer JA, Lee YY, Guajardo-Barron V, Chisholm D. Tackling of unhealthy diets, physically inactivity and obesity: health effects and cost-effectiveness. Lancet. 2010; 376:1775-1784.
18. Scottish Intercollegiate Guidelines Network. Risk estimation and prevention of cardiovascular disease. Scottish Intercollegiate Guidelines Network, Edinburgh; 2007.
19. Fifth Joint Task Force of the European Society of Cardiology European Guidelines on cardiovascular disease prevention in clinical practice (version 2012). European Heart Journal. 2012; 33:1635–1701.
20. Ford ES, Ajani UA, croft JB et al. Explaining the Decrease in U.S. Deaths from Coronary Disease, 1980–2000 N. Engl J Med. 2007; 356:2388-2398.