

Control and Prevention of Cardiovascular Disease Around the World

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The situation regarding cardiovascular disease in different parts of the world is presented, and the prevalence and trends in main risk factors based on Omran's epidemiological transition model are reported. A World Heart Federation survey documenting the limited human and technical resources in some developing countries and inadequate use of these resources in others is discussed. This survey also shows that few countries have guidelines for the management of cardiovascular disease and its risk factors, and reveals a lack of relationship between the percentage of countries with guidelines and the importance of a given disease or risk factor. Because economic resources for health in highly populated developing countries are limited, preventive measures for cardiovascular disease and its risk factors must be combined with those for all other chronic diseases. We recommend the following actions: *a)* improve the use of facilities for the dissemination of information; *b)* create suitable conditions for the development of research in developing countries; *c)* incorporate into primary care the innovations proposed by the WHO in 2002 to control chronic diseases, and *d)* assist in the development of the program proposed by the World Heart Federation.

Key words: *Cardiovascular diseases. Risk factors. Cardiovascular prevention. World Heart Federation.*

INTRODUCTION

The current ease of communication means we can now determine the worldwide situation regarding cardiovascular disease and foresee trends which will modify the future frequency and characteristics of this

Control y prevención de las enfermedades cardiovasculares en el mundo

Se expone la situación de las enfermedades cardiovasculares en diversas partes del mundo, así como la prevalencia y las tendencias de sus principales factores de riesgo, partiendo del modelo de transición epidemiológica propuesto por Omran. Se comenta la encuesta de la Federación Mundial de Cardiología, que mostró la limitación de los recursos humanos y tecnológicos en una parte de los países en vías de desarrollo y su uso inadecuado en los otros países. La encuesta mostró que sólo un número limitado de países posee instrucciones para el manejo de las enfermedades cardiovasculares y de sus factores de riesgo, así como la falta de relación entre el porcentaje de países con instrucciones y la importancia de una determinada enfermedad o factor de riesgo. La falta de recursos económicos para la salud en los países en vías de desarrollo y con mayor número de habitantes obliga a incluir la prevención de las enfermedades cardiovasculares y sus factores de riesgo con las restantes enfermedades crónicas. Se recomienda actuar en las siguientes áreas: *a)* mejorar el uso de facilidades para difundir la información; *b)* crear las condiciones adecuadas para la investigación en los países en vías de desarrollo; *c)* introducir en la atención primaria las innovaciones propuestas por la Organización Mundial de la Salud (OMS) en el año 2002 para el control de las enfermedades crónicas, y *d)* contribuir a desarrollar el programa propuesto por la Federación Mundial de Cardiología.

Palabras clave: *Enfermedades cardiovasculares. Factores de riesgo. Prevención cardiovascular. Federación Mundial de Cardiología.*

group of diseases.¹ As well as widening our horizon, this global vision can also help us in our work in our own geographical setting.

CARDIOVASCULAR DISEASE AROUND THE WORLD—THE CURRENT SITUATION

As we and Arun Chockalingam mentioned in the White Book of the World Heart Federation,² Omran's epidemiological transition model (Table 1) helps us understand the situation of cardiovascular disease in

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TABLE 1. Epidemiological Transcription Model

First phase: cardiovascular disease is due to infectious diseases and malnutrition
Second phase: social and economic development modify dietary composition and increase salt content in food, leading to hypertension and stroke
Third phase: the increased intake of calories and saturated fats, the introduction of smoking, a reduction in physical activity and the rise in mental stress precede the onset of coronary heart disease
Fourth phase: the reduction in risk factors and other measures delay the age of clinical onset of degenerative cardiovascular disease. Obesity and diabetes become the main risk factors
The shift from the second to the third phase has been quicker than expected in some developing countries

Adapted from Balaguer Vintró I.¹

different countries around the world. During the first phase of the epidemiological transition cardiovascular diseases were of infectious origin or related with poor nutrition. Rheumatic heart disease is still the heart disease with the greatest impact on death and disability in many countries in Asia and South America,³ whereas cardiomyopathy due to nutritional defects was reported before the 1970s in sub-Saharan West Africa, especially in young adults.⁴

The so-called second phase of the epidemiological transition has taken place in most countries around the world after starting the process of social and economic development. The changes associated with the use of salt in food, including its key role in food preservation before the advent and popularity of refrigerators, account for the appearance of hypertension in an increasing percentage of adults.⁵ The three main consequences of hypertension (heart failure, kidney failure, and stroke) became common causes of death in the developed world and remain so in many developing countries. Stroke is still the leading cause of cardiovascular death and disability in the adult population in China,⁶ as well as in other countries in southeast Asia and sub-Saharan Africa. The control of isolated systolic hypertension in older persons has reduced death from stroke and other cardiovascular complications in the developed world⁷ and in China.⁸

The third phase of the epidemiological transition is related to further advances in social and economic development. Diets rich in animal fats and cigarette smoking, together with changes in social habits such as the reduction in physical activity and the spread of stress, increase the prevalence of the main risk factors leading to the onset of coronary heart disease. Each country is in a particular phase regarding the epidemic of coronary heart disease, and the lipid-nutrition hypothesis of atherosclerosis and its clinical complications remains as strong as ever, despite the constant

controversy, nourished by the attention given to the role of other causes, the impossibility of experimental reproduction of the disease in humans, and the weight of the lobby of the dairy industry. Mortality rates due to coronary disease, although starting from different absolute figures, have all fallen over recent decades in developed countries but have begun to rise in those countries in central and eastern Europe whose market economies are in transition,⁹ as well as in many developing countries. Japan is a developed country believed to be in the second phase still, though not for genetic reasons because the Japanese reach the model of the third phase when they emigrate to third phase countries. Japan has experienced a notable reduction in stroke over recent years but no change in the low rate of death from coronary heart disease.¹⁰

The fourth phase of the epidemiological transition is marked by the fact that the reduction in the prevalence of the main risk factors in the general population delays the onset of degenerative diseases. The resulting increase in longevity sees a new population with cardiovascular problems at a later age and an increased prevalence of obesity and diabetes. Indeed, in the United States obesity and diabetes have become the main health related problems of this decade. Murray and López calculated the possible changes for 2020.¹¹ The reduction in overall mortality in developing countries arising from the decrease in current causes of mortality contrasts with the increased percentage of deaths from cardiovascular causes in most of these countries.^{12,13} Murray and López projected that coronary heart disease and stroke will be the second and fifth leading causes of death worldwide by 2020.¹¹ However, recognition must be afforded to the limitations of these predictions, which would improve if wider and more precise information were available on the weight of the diseases upon which to base future interventions,¹⁴ as is desirable.

TRENDS IN THE MAIN CARDIOVASCULAR RISK FACTORS AROUND THE WORLD

The two main cardiovascular risk factors, both well established since the beginning of the epidemiological transition, are hypertension and diabetes. The increase in life expectancy in developing countries and the resulting shift towards a more numerous adult population account for the increase in these countries of the number of persons with cardiovascular complications of hypertension and diabetes. When a particular country has not yet entered the phase of social and economic progress which result in the implantation of life styles which favor the other risk factors, the detection and control of hypertension and diabetes are the main objectives in the fight against cardiovascular disease in adults. For this reason, at the end of the 1970s the WHO placed the detection and control of hypertension

as the first objective in primary care. This objective has produced favorable results which have improved over time in most countries.¹⁵

Life styles associated with social and economic progress, and which favor the increase in cardiovascular disease during the third phase, include a diet rich in total calories and saturated fats, and smoking. To these must be added the recent reduction in physical activity and the increase in mental stress. Urbanization, the rapid advance of technology and the ease with which prepared foods can now be obtained explain the spread of the epidemic of obesity in developing countries.¹⁶ A recent survey in Mexico¹⁷ showed that obesity, hypertension and diabetes are more prevalent in young adults than older persons because young adults have already been affected by the influx of changes in life style. In some areas where the change has been very fast, the onset and increase in coronary disease have been spectacular. If low birth weight is really a risk factor,¹⁸ the conditions of poverty in developing countries until a few years ago could partially explain the current rapid increase in coronary disease in these countries.

Absolute serum cholesterol concentrations are associated with varying risk factors for coronary disease in different countries, although within a particular cohort there is always an individual relation between cholesterol levels and coronary risk.¹⁹⁻²¹ The same absolute cholesterol figure in southern Europe is associated with a lower risk than that in northern Europe, and this in turn is associated with a lower risk than the figure for the United States. The higher concentrations of high density lipoprotein (HDL) cholesterol in the population of sub-Saharan Africa may help explain the lower frequency of coronary heart disease, although the absolute figure of total cholesterol seems to be associated with a greater risk in South Africa and the African population of the Caribbean than in Mediterranean countries.

The reduction in the prevalence of these risk factors has been accompanied by a delay in the age of onset of cardiovascular disease. In the United States the national plans against cholesterol, blood pressure and smoking have resulted in obesity and diabetes now becoming the two main risk factors. An interesting phenomenon in the United States is the trend in mortality due to stroke,²² since the widening of the preventive programs against smoking and cholesterol have resulted in a reduction in the energy applied to the first program introduced against hypertension. In an attempt to recover protagonism in the fight against hypertension the concept of "prehypertension" has been created for persons with blood pressure figures above the ideal of 120/80 mm Hg. Logically, no medication is recommended for these persons but the measurement places them at the center of the target for general prevention programs.²³ This measure has been strengthened with

the Seventh Report of the Joint National Committee²⁴ and the recently published update of the Spanish Society of Cardiology.²⁵

The so-called "new" coronary risk factors, i.e. those which have been identified since the 1990s such as hyperhomocystinemia, lipoprotein (a), the antiphospholipid syndrome, low isolated HDL cholesterol levels, or antioxidizing vitamins, do not have sufficient weight to be possible causes of differences or trends between countries,²⁶ and they are only expected to have a complementary role in the changes seen in developing countries.

HUMAN AND TECHNICAL CARDIOLOGY RESOURCES AROUND THE WORLD

The survey on human and technical resources in cardiology, sent by the World Heart Federation (WHF)² to the presidents of 57 National Societies of Cardiology (77% response rate) and to 48 ministers of health in developing countries and to at least one million persons in countries with no National Society of Cardiology (33% response rate), provided first hand information for the WHF White Book (Table 2). The average number of cardiologists in countries in Asia and sub-Saharan Africa is 2.1 per million inhabitants. In South America, developing countries in the East and countries with transition market economies in central and eastern Europe, the number of cardiologists, newly trained cardiologists each year, and other cardiology-related professionals is similar to that of developed countries. However, the number of patients undergoing interventional cardiology for diagnosis or treatment, cardiac surgery, or placement of pacemakers is much lower in the developing countries and in those countries with transition market economies. However, this extremely low number of diagnostic or therapeutic interventions in a large part of the world cannot be attributed to a lack of human resources. Rather, this low number may be the result of the inadequate utilization of resources or because the same name is given to the titles of professionals who have a very different training and whose functions differ considerably.

PUBLIC HEALTH INFRASTRUCTURES AND PREVENTIVE ACTIVITIES IN DEVELOPING COUNTRIES

A second survey² sent to the same persons as before provided information about the structure of public health services and their preventive activities in the cardiovascular field (Table 3). When developing countries were asked whether instructions existed for the management of cardiovascular disease and its risk factors, fewer than half the answers were positive for rheumatic heart disease, which is still an important

TABLE 2. Human and Technical Cardiology Resources Around the World per Million Inhabitants

	Cardiologists		Cardiac Surgeons	Cardiovascular Technicians	Cardiovascular Nurses
	Total	New/Year			
Spain	50.2	1.5	6.4	7.5	12.5
Asia and Africa	2.1	0.2	0.9	0.5	1.7
South America/Middle East	65.0	1.7	5.0	7.0	5.1
Eastern Europe	41.9	2.0	6.0	7.8	102.5

According to data from the surveys of the White Book of the World Heart Federation compared with data for Spain, provided by the Spanish Society of Cardiology. Adapted from Balaguer Vintró I.¹

disease in many areas of the world and for which prevention is well accredited. About 60% replied that instructions existed for the management of hypertension, which reflects the interest shown by the WHO and other international organizations, as well as the influence of the United States, where hypertension was the target of the first national prevention campaign. However, what surprises is that more countries have instructions for the control of lipids than for the control of smoking, and very few countries have instructions for the control of diabetes. We believe that the true figures may be even lower than those provided in the answers to the questionnaires. When responding to what happens in one's own country one naturally tends to give better results than if one were to provide an objective examination of the situation.

FRAMEWORK FOR THE CONTROL OF THE CARDIOVASCULAR PANDEMIC IN DEVELOPING COUNTRIES

The prevention of the cardiovascular pandemic and the control of cardiovascular disease in developing countries should be examined within a suitable framework of reality. Together with public health, the four challenges of sustainable development are water, energy sources, biodiversity and agriculture.²⁷ In order to avoid being utopian, a good mental exercise consists of determining the amount of money which developing countries can dedicate to the public health budget. Assuming the hypothetical health care budget to be 5% of the per capita gross national product (GNP), the figure given to health care per

TABLE 3. Countries With Instructions for the Control of Cardiovascular Disease and its Risk Factors or National Preventive Programs

	Asia Africa	South America Middle East	Eastern Europe	Total
Countries with instructions				
Positive answers, %				
Rheumatic heart disease	42	50	33	40
Myocardial infarction	21	50	44	36
Heart failure	26	40	39	34
Stroke	16	20	33	23
Hypertension	53	70	56	58
Dyslipidemia	21	60	56	43
Smoking	32	30	22	28
Diet	21	40	22	26
Diabetes	16	30	22	21
Physical activity	16	30	22	21
Obesity	0	10	17	9
Countries with national prevention programs, %				
Cardiovascular disease	32	50	33	36
Hypertension	26	40	44	36
Smoking	42	10	39	34
Diabetes	26	30	44	34
Rheumatic heart disease	42	40	32	32

Modified from Balaguer Vintró I.¹

person per year (Table 4), using concrete examples with data from 1997-1998, would be 5 dollars for Ethiopia, 17 for India, and 31 for China.² However, we should be realistic and situate the prevention and control of cardiovascular disease in developing countries within a possible framework. We shall therefore focus on concrete aspects which are valid for most adult chronic diseases: diffusion of information, research in developing countries, modification of primary care, and finally the role of the World Heart Federation.

THE USE OF SERVICES FOR DISSEMINATING INFORMATION

The current possibilities for the dissemination of information should be used much more. Lack of equality in the diffusion of information via Internet seems to be great. Measures to improve this situation have been proposed as the most important for public health care in developing countries.²⁸ January 2001 saw the start of the HINARI program, an agreement between the WHO and the editors of the main medical journals. The aim of the program is to provide the leading medical journals to health care centers in developing countries at no expense or a very reduced cost.^{29,30} Similarly, Bernard Lown, winner of the Nobel Peace prize and founder of the Association of Physicians against Nuclear War, created the platform PROCOR (www.procor.org) to promote dialogue and disseminate the cardiologic culture among health care professionals in developing countries.

RESEARCH IN DEVELOPING COUNTRIES

Multinational clinical research, with the participation of both developed and developing countries, is the subject of controversy³¹ due to the level of health care which is acceptable for randomized trials and to the need to provide developing countries with reasonable access to those interventions with proven safety and efficacy. Studies of the bioethical aspects of clinical research in developing countries have recently appeared.³²⁻³⁴

Those who desire to undertake research in developing countries do not want their role to be limited to mere extras and expect the main journals to be open to publication of worthy articles. With data from a survey sent to 80 clinical researchers in developing countries, Horton³⁵ reported that the main obstacles to undertaking research and sending the results for publication in leading journals were the belief that the article would be rejected without any evaluation, the fear of being made to appear stupid due to the excess responsibility in positions normally occupied by persons who have received a good training in epidemiology, and ethical problems preventing the usual type of research seen in developed countries.

PROMOTION OF INNOVATIONS IN THE CONTROL OF CHRONIC DISEASES IN COUNTRIES WITH LIMITED RESOURCES

In 2002 the WHO published a report titled "Innovative care for chronic conditions. Building blocks for

TABLE 4. Differences Between Some Countries in Health Needs and Resources*

	Population (Millions)	Younger Than 35 Years (%)	Life Expectancy (Years)		Hypothetical Minimum Health Budget (5% GNP in Dollars) per Person per Year
			Male	Female	
Ethiopia	62	78	48	52	5
Cameroon	14	77	55	57	33
Egypt	66	70	65	73	40
Morocco	28	72	65	69	56
Bangladesh	124	75	58	58	6
India	975	68	62	62	17
China	1.255	61	68	72	31
Pakistan	147	75	62	65	23
Peru	25	71	66	71	116
Colombia	38	69	67	74	96
Brazil	165	66	63	71	182
Argentina	36	60	68	72	402
Bulgaria	8	46	68	75	66
Russia	147	48	58	72	112
Hungary	10	46	64	74	206
Lithuania	4	49	65	76	95

*GNP indicates gross national product.
Adapted from Balaguer Vintró I.¹

action.”³⁶ This document provided a comprehensive conceptual framework for the prevention and management of long-term chronic diseases in settings with limited resources.³⁷ The report collates and translates to concrete measures the experience acquired in community programs for the control and prevention of chronic diseases since the Kaunas meeting in 1981.³⁸ These programs lost interest at the beginning of the 1990s in developed countries due to the difficulty of incorporating the role of the community or because they had simply served as an excuse for some persons to move up the ladder, and in developing countries because priority was given to resolving more immediate and basic problems. The prevention and control of chronic diseases in developing countries is mostly in the hands of primary care personnel. The funds available for health require the problems to be prioritized and activities to be undertaken jointly wherever possible. The proposals in the WHO report are applicable to the prevention of cardiovascular disease and other chronic diseases in developing countries (Table 5). The control of chronic diseases requires the introduction of health care services with concrete, long-term objectives. Patients and health care personnel, but first and foremost the decision-makers, must all be convinced that control of a chronic disease demands a different type of medical action to that commonly applied because problems need to be addressed individually and urgently. Health care must be aligned with the activities of other departments for the agreed measures of change to be effective. Health care personnel with less formal training must be integrated and given a suitable position, as too must trained volunteers. The current system relegates the patient to the passive posi-

tion of a spectator, renouncing the opportunity for him or her to become the leader in promoting personal health. Consideration of the patient's viewpoint is associated with greater satisfaction, better compliance and improved continuity in the follow-up.³⁹ The health care of chronic patients does not start or end at the door to the hospital. The community must cover the vacuum in health care services not provided by the health system. Political and religious leaders should put aside their differences and personal interests and work together for the people they serve.⁴⁰

The WHO document recommends the promotion of the following preventive strategies: early detection, increased physical activity, a reduction in smoking and limiting unhealthy nutrition. This program, which is the minimum which should figure in any health care intervention, is based on the fact that most chronic diseases and their complications can be prevented, or at least delayed.

CONTRIBUTION OF THE WORLD HEART FEDERATION, THE WORLD HEALTH ORGANIZATION AND OTHER ORGANIZATIONS IN THE CONTROL OF THE CARDIOVASCULAR PANDEMIC

Since the first Ten Day Seminar on Cardiovascular Epidemiology and Prevention⁴¹ held in Makarska in 1968, the World Heart Federation, through its corresponding Council, has organized a Ten Day Seminar each year with international participation, higher grade seminars for previous participants and some seminars specially for participants from one or just a few countries, including several in China and, in the summer of 1985, in El Pualar, Spain.⁴² Most, if not all of those who have studied cardiovascular epidemiology in developing countries, as well as most of those working in this field in developed countries, have participated in these seminars. We should not forget the leading role played in the organization and development of these seminars by Rose Stamler and Geoffrey Rose, both of whom are now sadly missed.

The WHO has centered the study and prevention of cardiovascular disease in developed countries because of the presence of experts in these countries. Thus, the only developing country to participate actively in the MONICA project was China, which incidentally provided very faithful information. The recent change in direction of the WHO has opened up new possibilities which must be exploited, starting by adapting to the particular situation in different areas of the world.⁴³

During the presidency of Antonio Bayés de Luna, the World Heart Federation published the White Book mentioned above² and introduced a series of proposals centered on World Heart Day and the promotion of agreements which were applicable to and acceptable by developing countries, as well as possible bilateral

TABLE 5. World Health Organization Proposals for the Prevention and Control of Chronic Diseases in 2002

The eight essential elements for action:

1. Introduce extended, regular health care contact
2. Build consensus and political commitment
3. Build integrated health care
4. Health care should be aligned with labor practices, agricultural regulations, teaching health promotion in schools, etc
5. Health care personnel with less formal education and trained volunteers have critical roles
6. Health care should be re-oriented around the patient and family
7. Patients and families need services and support from their communities
8. The following preventive strategies should be promoted: early detection, increasing physical activity, reducing tobacco use, and limiting unhealthy nutrition

Taken from the WHO Global Report.³⁶

accords between centers in both worlds for the training of specialists and other professionals.⁴⁴ The continuity of these activities and their future development depend in great part on the degree of leadership which the World Heart Federation is able to wield and, therefore, on its directors.

REFERENCES

1. Balaguer Vintró I. Estudio comparativo de la cardiología en el mundo. In: Bayés de Luna A, López-Sendón JL, Attie F, Alegría Ezquerro E, editores. *Cardiología clínica*. Barcelona: Masson, 2003; p. 979-85.
2. Chockalingham A, Balaguer-Vintró I. Pandemia global inminente de las enfermedades cardiovasculares. World Heart Federation. Barcelona: Prous Science, 1999.
3. WHO Program for the prevention of rheumatic fever/rheumatic heart disease in 16 developing countries: report from phase I (1986-1990). *Bull WHO* 1992;70:213-8.
4. McKinney B. Tropical cardiomyopathies. En: McKinney B, editor. *Pathology of cardiomyopathies*. London: Butterworth Co., 1974; p. 127-58.
5. Intersalt: an international study of electrolyte excretion and blood pressure. Results for 24 hour urinary sodium and potassium excretion. Intersalt Cooperative Research Group. *BMJ* 1988;297:319-28.
6. Yao C, Wu Z, Wu Y. The changing pattern of cardiovascular disease in China. *World Hlth Statist Quart* 1993;46:113-8.
7. Fagard RH, Staessen JA. Treatment of isolated systolic hypertension in the elderly: the Syst-Eur trial. Systolic Hypertension in Europe (Syst-Eur) Trial Investigators. *Clin Exp Hypertension* 1999;21:491-7.
8. Liu L, Wang JC, Celis H, Staessen JA. Implications of the systolic hypertension in China trial. *Clin Exp Hypertension* 1999;21:499-505.
9. Sans S, Kesteloot H, Kromhout D, on behalf of the Task Force. The burden of the cardiovascular disease mortality in Europe. Task Force of the European Society of Cardiology on Cardiovascular Mortality and Morbidity Statistics. *Eur Heart J* 1997;18:1231-48.
10. Koga Y, Hashimoto R, Adachi H, Tsuruta M, Tashiro H, Thosima H. Recent trends in cardiovascular disease and risk factors in the Seven Countries Study: Japan. En: Thosima H, Koga Y, Blackburn H, Keys A, editors. *Lessons for Science from the Seven Countries Study*. Tokyo: Springer-Verlag, 1994; p. 63-74.
11. Murray CHJL, López AD. The global burden of disease. A comprehensive assessment of mortality and disability from diseases, injuries and risk factors in 1990 and projected to 2020. Harvard: Harvard School of Public Health on behalf of the WHO and the World Bank, 1996.
12. Reddy KS, Yusuf S. Emerging epidemic of cardiovascular disease in developing countries. *Circulation* 1998;97:596-601.
13. Yusuf S, Reddy S, Ounpuu S, Anand S. Global burden of cardiovascular diseases. II: Variations in cardiovascular disease by specific ethnic group and geographic regions and prevention strategies. *Circulation* 2001;104:2855-64.
14. Bettcher D, Lee K. Globalisation and public health. *J Epidemiol Community Health* 2002;56:8-17.
15. Sans S, Paluzie G, Balañá L, Puig T, Balaguer-Vintró I. Tendencias en la prevalencia, conocimiento, tratamiento y control de la presión arterial entre 1986 y 1996: Estudio MONICA-Cataluña [fe de errores en Med Clin [Barc] 2001;117:731]. *Med Clin (Barc)* 2001;117:246-53.
16. Friedrich MJ. Epidemic of obesity expands its spread to developing countries. *JAMA* 2002;287:1382-6.
17. Velázquez-Monroy O, Rosas Peralta M, Lara Esqueda A, Pastelín Hernández G, Castillo C, Attie F, et al. Prevalencia e interrelación de enfermedades crónicas no transmisibles y factores de riesgo cardiovascular en México: resultados finales de la Encuesta Nacional de Salud (ENSA) 2000. *Arch Cardiol Mex* 2003;73:62-77.
18. Barker DJP, Winter PD, Osmond C, Margetts B, Simmonds SJ. Weight in infancy and death from ischaemic heart disease. *Lancet* 1989;2:577-80.
19. Chen Z, Peto R, Collins R, MacMahon S, Lu J, Li W. Serum cholesterol concentration and coronary heart disease in population with low cholesterol concentrations. *BMJ* 1991;301:276-82.
20. Menotti A, Puddu PE, Lanti P. Comparison of the Framingham risk function-based coronary chart with risk function from an Italian population study. *Eur Heart J* 2000;21:365-70.
21. Tomás Abadal L, Varas Lorenzo C, Pérez I, Puig T, Balaguer Vintró I. Factores de riesgo y morbilidad coronaria en una cohorte laboral mediterránea seguida durante 28 años. Estudio de Manresa. *Rev Esp Cardiol* 2001;54:1146-54.
22. Gillum RF, Sempos CT. The end of the long-term decline in stroke mortality in the United States. *Stroke* 1996;28:1527-9.
23. Writing Group of the PREMIER Collaborative Research Group. Effects of comprehensive lifestyle modification on blood pressure control. *JAMA* 2003;289:2083-92.
24. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL Jr, et al, for the National Heart, Lung, and Blood Institute Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure; National High Blood Pressure Education Program Coordinating Committee. The Seven Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure: the JNC 7 report. *JAMA* 2003;289:2560-72.
25. González-Juanatey JR, Mazón Ramos P, Soria Arcos F, Barrios Alonso V, Rodríguez Pardal L, Bertomeu Martínez V. Actualización (2003) de las Guías de Práctica Clínica de la Sociedad Española de Cardiología en hipertensión arterial. *Rev Esp Cardiol* 2003;56:487-97.
26. Balaguer Vintró I. Epidemiología de la cardiopatía isquémica: avances y controversias. En: Zarco P, editor. *Cardiopatía isquémica*. Madrid: Médica Panamericana, 2000; p. 23-41.
27. von Schirnding Y. Health and sustainable development: can we rise to the challenge? *Lancet* 2002;360:632-7.
28. Torres ETT. Disseminating health information in developing countries: the role of internet. *BMJ* 2000;321:797-800.
29. Kmietowicz Z. Deal allows developing countries free access to journals. *BMJ* 2001;323:65.
30. Smith R. Closing the digital divide: remarkable progress is being made. *BMJ* 2003;326:238.
31. Participants in the 2001 Conference on Ethical Aspects of Research in Developing Countries. Ethics. Fair benefits for research in developing countries. *Science* 2002;298:2133-4.
32. Angell M. The ethics of clinical research in the Third World. *N Engl J Med* 1997;337:847-9.
33. Angell M. Investigators' responsibilities for human subjects in developing countries. *N Engl J Med* 2000;342:967-8.
34. Zumla A Costello A. Ethics of healthcare research in developing countries. *J R Soc Med* 2002;95:275-6.
35. Horton R. North and south: bridging the information gap. *Lancet* 2000;355:2231-6.
36. Global Report. Innovative care for chronic conditions: building blocks for action. Geneva: WHO, 2002.
37. Swartz L, Dick J. Managing chronic diseases in less developed countries. Healthy teamworking and patients partnership are just as important as adequate funding. *BMJ* 2002;325:914-5.
38. Sans Menéndez S, Balaguer Vintró I. Programa CRONICAT: experiencia en la prevención de las enfermedades cardiovasculares. *Rev Clin Esp* 1987;180:35-7.

39. Holman H, Lorig K. Patients as partners in managing chronic disease. Partnership is a prerequisite for effective and efficient healthcare. *BMJ* 2000;320:526-7.
40. Avery G. Comparative efficiency of national health systems: developed countries must pay attention to wider issues in helping developing countries. *BMJ* 2002;324:48.
41. Labarthe DR, Khaw KT, Thelle D, Poulter N. The Ten Day International Teaching Seminars on Cardiovascular Epidemiology and Prevention. A 30-year perspective. *CDV Prevention* 1998;1:156-63.
42. Spanish Ten-Day Seminar on Cardiovascular Epidemiology and Prevention. *CVD Epidemiol Newsletter* 1986;40:160-1.
43. Bunout D, Escobar E. Prevención cardiovascular en América Latina. *Rev Esp Cardiol* 2000;53:889-95.
44. Bayés de Luna A. International cooperation in world cardiology. The role of the World Heart Federation. *Circulation* 1999;99:986-9.