

Editorial

Noncommunicable diseases: a major challenge to public health in the Region

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Introduction

Developing countries are experiencing dramatic changes in the health needs of their populations. Although many countries currently face a double burden of infectious diseases and noncommunicable diseases (NCDs), the latter, including cancer, diabetes and cardiovascular diseases (CVDs), are fast replacing the traditional enemies of infectious diseases and malnutrition as the leading causes of disability and premature death. This trend will continue and by the year 2020, NCDs are expected to account for seven out of every ten deaths in the developing regions, compared with less than half today [1].

The so-called "epidemiological transition" is taking place in part because of the rapid aging of the developing world's populations, progressive urbanization and socioeconomic transformation. Another major factor involves changes in nutritional patterns experienced over the past few decades. As diet changes, usually to include a smaller proportion of complex carbohydrates and more sugar and animal fat, people become more susceptible to NCDs. Obesity becomes more prevalent and, coupled with less physical activity, it increases the risk of morbidity and premature death,

particularly from CVD and diabetes. Epidemiological studies also provide evidence that dietary fats influence the risk of certain cancers such as those of the breast and colon and rectum. Additionally, excessive alcohol intake is associated with increased risk of cancer in the oral cavity, pharynx, larynx, oesophagus and liver. High salt intake increases hypertension, raising the risk of stroke and coronary heart disease (CHD). Decades of research, involving all major types of biomedical investigation, have conclusively shown that modern "disturbances of human culture", operating from early childhood onward, are responsible for the epidemic of atherosclerotic diseases. These disturbances include a "rich" diet associated with elevated levels of blood pressure, serum cholesterol and body weight as well as a high prevalence of diabetes, the 20th century mass habit of cigarette smoking and a sedentary lifestyle [2].

In many countries of the Eastern Mediterranean Region (EMR), the health aspect of the epidemiological transition is already much further advanced than many health policy-makers appreciate. Although health officials and the medical profession have a general awareness of the increasing occurrence of NCDs, the problem has, in general, not received the attention it deserves and

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its extent has not been sufficiently examined. Awareness among the general population of the adverse health consequences of the new behaviour and lifestyles is likewise inadequate. Largely because of the long delay between cause and effect, people tend to misjudge the hazards of these lifestyles. For example, when young adults begin to smoke, they do not witness the high mortality associated with their behaviour until they reach middle age.

Since treatment of established NCDs is expensive and for some diseases often ineffective, prevention is the best way of avoiding growth in the burden of these diseases and in unnecessary health care expenditure.

This report provides a brief overview of the magnitude and epidemiological patterns of the three major NCDs (CVD, diabetes and cancer) in the EMR and examines feasible interventions and appropriate preventive strategies.

Epidemiological situation in the Region

Demographic and socioeconomic trends

During the past three decades, Member States have generally made considerable progress in the control of the communicable diseases of childhood. At present, the infant mortality rate is less than 50 per 1000 live births in 16 countries of the Region compared with only two countries around 1970 [3,4]. These changes are perhaps more apparent in the member countries of the Gulf Cooperation Council where infant mortality has fallen significantly and where fertility rates remain comparatively high. In Oman, for example, the infant mortality rate has dropped from 159 per 1000 live births in 1970 to below 30 per 1000 live births in 1990, a period of only 20 years [5]

while the fertility rate has changed comparatively little from 7.2 in 1970 to 6.8 in 1990; the global fertility rate was 3.3 in 1990 [6].

With the decline in infant and child mortality and the high fertility, there has been a rapid growth in the population. Around 1970, the life expectancy at birth was under 50 years in nine countries, a figure which now applies in only three countries [3,4]. Currently, the life expectancy in the majority (16) of the countries exceeds 65 years of age [4] (the global average is 66 years [6,7]) and in six countries the life expectancy is 70 years or over [4]. Thus, large numbers of the population are advancing to ages previous generations were not able to enjoy.

While the per capita gross national product (GNP) ranges from US\$ 170 to US\$ 18 642 [4] many countries have experienced economic growth and development over the past three decades. For the oil exporting Arab countries of the Gulf, the growth and development has been dramatic. This socioeconomic development has brought about benefits such as improved access to health care, education, safe drinking water and sanitation. Unfortunately, it has also brought about changes in lifestyle, nutrition and traditional social and family structures.

Nutritional trends

Considerable changes in food consumption patterns have occurred over the past 30 years. Analysis of the data collected from some countries on dietary consumption trends demonstrates a rapid rise in food energy availability and consumption beyond requirement [8]. Data from the Regional Office for the Near East of the Food and Agriculture Organization of the United Nations, based on food balance sheets for certain Arab countries, indicate that the per

capita food energy and protein availability has doubled and fat has increased three fold [9]. Cereals, which contribute more than half the energy and protein supply to Arab populations, increased in terms of per capita availability during the period 1961–1990. The degree of this increase varied from one country to another but rice availability increased five fold in some countries and that of wheat eight fold. During the same period, sugar availability was also reported to have increased by up to 300% in one country. Similarly, all countries showed a very large increase in the per capita oil supply. On the other hand, there was no comparable increase in the availability of vegetables and there was in fact a general decrease in some countries. Only a slight increase in the per capita supply of fruits occurred during this period [9]. Based on these data, it is important to note that the enormous changes seen in food consumption patterns have not been restricted to oil-rich countries. They have also been observed in less affluent countries in which wheat and rice are replacing the traditional high-fibre cereals.

It is predicted that if the increase in caloric consumption continues at the present rate, the consumption of calories will exceed that in industrialized countries in less than a decade [8]. Obesity is emerging as a major problem. Among Saudi Arabian adults aged 18 to 74 years attending a primary health care centre, 51.5% of the men and 65.4% of the women were obese (body mass index ≥ 25 kg/m²). Overall, marked obesity, defined as body mass index of 30 kg/m² or higher, was seen in 25% of people attending the centre [10].

Other risk factors

In addition to the nutritional trends already discussed, there are other risk factors which are contributing to the increasing

magnitude of CVDs, diabetes and cancer. Available data indicate a considerable and steady increase in tobacco consumption over the past three decades. Imports and manufacture of cigarettes are progressively increasing. Data also demonstrate high rates of smoking in the EMR, especially among men [11]. A smoking prevalence rate among adult males of up to 40% is reported from some countries [12]. A high prevalence of smoking has also been consistently reported among patients who have suffered acute myocardial infarction [13]. Needless to say, extensive evidence is available about the role of smoking in causing several types of cancer. Since CVDs are the major causes of death among people with diabetes, smoking is considered to be a significant factor affecting morbidity and mortality from both types of diabetes.

Very little is known about physical activity on a population basis in the Region. With few exceptions, physical inactivity as a risk factor in NCD has not been adequately evaluated. Although some government facilities are available for sport, these facilities are often restricted to team sports and are not always available to the general public. Several barriers to promoting physical activity exist, particularly among women.

Diabetes and impaired glucose tolerance, well recognised risk factors for CVD, are increasingly encountered. The epidemiological situation of diabetes in the Region is reviewed below.

Three major noncommunicable diseases in the Region

Cardiovascular diseases

Extensive knowledge is now available on the global epidemiology of CVDs and diabetes. A well established finding is the increasing prevalence of the main risk factors

and the recent emergence of CVD and diabetes epidemics in developing countries. In the EMR, reliable and complete mortality data are difficult to obtain and many countries do not report death by cause. However, data reported from many countries such as Bahrain, Cyprus, Egypt, Iraq, Jordan, Kuwait and Qatar in recent years provide useful indicators of mortality trends. In these countries, CVDs are reported as the leading identifiable cause of death [14]. The main CVDs encountered include coronary heart disease, hypertension and stroke.

Data from Kuwait indicate an increasing death rate from coronary heart disease and hypertension [15]. Deaths from CVDs, accidents and malignant neoplasms accounted for almost half the general mortality rate in 1984. Diseases of the circulatory system were reported to be responsible for 37% of deaths in Qatar in 1992 and about 30% in Bahrain [16,17]. In Jordan, CVDs were reported as the leading cause of death in 1991, accounting for 44.4% of male and 34.5% of female mortality; in 1961, 1970, 1979 and 1985 the corresponding figures were 5.0%, 12.6%, 22.2% and 39.1% for males and 2.9%, 13.0%, 18.5% and 27.2% for females. There were concomitant reductions in mortality caused by communicable diseases [18]. Despite the fact that mortality data may be incomplete in some countries, there is enough evidence to indicate rising trends in mortality from CVDs.

Coronary heart disease seems to be the predominant type of cardiopathy encountered in many countries. For example, coronary heart disease, including acute myocardial infarction, was reported to be the fourth leading cause of admission at the Salmaniya Medical Centre in Bahrain [17]. In Jordan, a progressive increase in coronary heart disease cases between 1973 and 1987 has been reported and this was associated with a decline in the number of cases

of rheumatic heart disease [18]. At Queen Alia Heart Centre, almost half the patients with angiographically confirmed disease were below the age of 50 years and only 17% were above the age of 60 years [19].

Data on hypertension have been reported from many countries including Cyprus, Egypt, Islamic Republic of Iran, Iraq, Morocco, Oman, Pakistan and Saudi Arabia. Hypertension (blood pressure $\geq 140/90$) has been reported to affect more than 20% of adults. However, some surveys conducted over the past two decades were based on different diagnostic criteria and age composition of the sample studied and are therefore difficult to compare. According to a recent survey, 26% of adult Egyptians suffer from hypertension, a rate higher than figures reported for the United States population [20]. A similar figure (23.6%) was reported by a survey conducted on a sample of Omani adults [21]. A higher rate was reported elsewhere [22]. The prevalence of hypertension appears to be lower in rural than in urban areas [23,24].

Studies have also shown a low detection rate among people with high blood pressure. Up to 60% of those discovered to have a blood pressure of 140/90 or higher were not aware of their elevated blood pressure before the survey [23-25].

Based on a conservative hypertension prevalence figure of 20% in the population 20 years and older, and assuming that 60% of cases are undiagnosed, it can be estimated that there are over 44 million people in the EMR with high blood pressure; more than 26 million have undiagnosed hypertension.

Diabetes mellitus

Several epidemiological surveys on diabetes have been conducted in the Region over the past decade. Those that employed comparable methodology and diagnostic crite-

ria, based on World Health Organization (WHO) recommendations, deliver a consistent and disturbing message: diabetes in these populations is considerably more prevalent than in Europe and North America [26]. Data on the epidemiological and clinical characteristics of the two types of diabetes have been reported from Egypt, Iraq, Jordan, Kuwait, Lebanon, Libyan Arab Jamahiriya, Oman, Saudi Arabia, Sudan, Tunisia and Yemen. With the exception of Sudan, the prevalence of diabetes in population samples aged 20 years and over, utilizing WHO diagnostic criteria, has been reported to be around 10% [27-30]. There are rural/urban differences in prevalence. The Egyptian study reported an overall prevalence of 9.3% but the prevalence went up to 20% in population samples taken from higher socioeconomic classes in urban areas [30]. In Oman, an additional 10% of the sample had impaired glucose tolerance [28]. In Sudan, the results of a recent survey conducted on a population sample aged 25 years and over revealed a crude prevalence of 2.4% for diabetes and 2.9% for impaired glucose tolerance. The highest prevalence was seen in the northern parts of Sudan (5.5%) and the lowest in the western desert-like areas (0.9%) [29].

One consistent finding of all surveys is the low detection rate. The percentage of undiagnosed diabetes ranges from 40% to over 60% [27-30].

Cancer

Despite the paucity of morbidity and mortality data in most countries of the Region, there is enough evidence to indicate that cancer is now becoming a major public health concern.

Published reports on the magnitude of the cancer problem are scarce, and population-based cancer registries have been es-

tablished in only a few countries. Hospital-based frequencies are, however, available from the major cancer treatment centres from almost all countries in the Region. Though biased, they provide some insight into the prevailing cancer patterns. Reported mortality statistics from countries indicate that cancer is emerging as one of the leading causes of death, occupying the third place in some countries [11].

Estimates provided by the International Agency for Research on Cancer indicate that over 450 000 new cancer cases occurred in the Region during 1995. The common cancer sites in males are lung, lymphoid tissue, urinary bladder, stomach and mouth/pharynx. In females, breast, urinary bladder, lymphoid tissue and uterine cervix are the common cancer sites. However, regional variations exist, as can be observed from the country profiles; for example, high frequencies of nasopharyngeal carcinoma in males and uterine cervical cancer in females are reported in Morocco and Sudan. Further details on cancer patterns in countries of the EMR can be obtained from the 1995 WHO publication *Cancer control in the Eastern Mediterranean Region* [11].

Based on data from member countries, there are significant variations in cancer profiles that must be taken into consideration when planning and implementing national cancer control programmes. While cancer of the lung appears to be the leading cancer among males in many countries, other types of cancer, such as lymphoma/leukaemia and urinary bladder and nasopharyngeal neoplasm, may be more important in other countries. In females, breast cancer is the leading type in most countries but cancer of the uterine cervix appears to predominate in Morocco. In view of the current trends in the use of to-

bacco, the prevalence of lung cancer will continue to increase in coming years.

Potential for prevention

The three major NCDs are preventable. A great amount of evidence from various scientific disciplines testifies to the preventability of coronary heart disease. The results of community intervention studies provide further evidence that coronary heart disease is preventable. On the basis of epidemiological and other evidence, many countries have identified the prevention of coronary heart disease as a national health priority. Similarly, there is much scope for prevention of other CVDs like hypertension and stroke as well as non-insulin-dependent diabetes mellitus. Prevention of cancer is also possible and early detection with the aim of potential cure is feasible for many cancers. It is estimated that over one-third of cancers are preventable and another one-third are potentially curable provided they are detected early in their course [31]. It is important to remember that coronary heart disease, hypertension, stroke, non-insulin-dependent diabetes mellitus and many cancers share the same risk factors, and strategies for prevention can therefore be integrated into one common approach. Such an integrated approach is particularly recommended in countries experiencing epidemiological transition and in those countries where these NCDs exist in high proportions.

Four levels of prevention can be identified, corresponding to different phases in the development of disease: *primordial*, *primary*, *secondary* and *tertiary*. All are important and complementary, although primordial and primary prevention have the most to contribute to the health and well-being of the whole population.

The aim of *primordial prevention* is to avoid the emergence and establishment of the social, economic and cultural patterns of living that are known to contribute to an increased risk of disease. Primordial prevention for the three major NCDs should include national policies and programmes on food and nutrition, comprehensive policies to discourage smoking and programmes to promote regular physical activity.

The purpose of *primary prevention* is to limit the incidence of disease by controlling causes and risk factors. For example, most of the deaths attributable to CVDs occur in the middle range of the cholesterol level, where the majority of the population lies; in this case, primary prevention depends on widespread changes that reduce the average risk in the whole population. The most practical way to do this is to shift the whole distribution to a lower level [14]. Similarly, a shift in the population distribution of blood pressure to a lower range, with benefits across the whole range of risks, along with targeted interventions of persons who are at a higher individual risk, will provide a comprehensive preventive strategy for hypertension, stroke and coronary heart disease. In general, primary prevention includes efforts to discourage unhealthy eating habits, reduce obesity, promote physical activity and control smoking. It involves two strategies that are often complementary. It can focus on the whole population, with the aim of reducing average risk (population strategy) or on people at high risk as a result of particular exposures (high-risk strategy).

Secondary prevention aims to cure patients and reduce the more serious consequences of disease through early diagnosis and treatment. It comprises the measures available to individuals and populations for early detection and prompt and effective

intervention. It is directed at the period between onset of disease and the normal time of diagnosis, and aims to reduce the prevalence of disease. Secondary prevention can be applied only to diseases in which the natural history includes an early period when it is easily identified and treated, so that progression to a more serious stage can be stopped.

Tertiary prevention is aimed at reducing the progress or complications of established disease and is an important aspect of therapeutic and rehabilitation medicine. It consists of measures intended to reduce impairment and disability, to minimize suffering caused by departure from good health and to promote patient adjustment to incurable conditions. Tertiary prevention is often difficult to separate from treatment since the treatment of chronic disease has, as one of its central aims, the prevention of recurrences.

Both hypertension and diabetes lead to serious, disabling and potentially fatal complications. Appropriate management and control of these diseases are therefore essential if we are to reduce the development of these complications. There is now firm evidence to indicate that the degree of control is related to the frequency and severity of long-term complications [32,33]. Thus, the major goal of management should be to maintain blood pressure levels and blood glucose levels that are close to the normal limits. For secondary and tertiary prevention, good management should be ensured and appropriate health care delivery to people with diabetes should be made available. Further details on the integration of hypertension and diabetes care into primary health care can be found in *Prevention and management of hypertension* [32] and *Management of diabetes mellitus, standards of care and clinical practice guidelines* [33].

As far as cancer is concerned, the strategies adopted include, in addition to primordial, primary and secondary prevention (early detection levels), activities on palliative care and pain relief. In industrialized countries, more than 60% of cancer patients die of their disease; in developing countries the figures are much higher [34]. Although a substantial proportion of cancer patients experience pain, evidence indicates that such pain is often inadequately treated. Considerable improvements in the quality of life for people with incurable cancer and their families could be achieved by implementation of existing knowledge of pain and symptom control. Guidelines for pain relief and palliative care are provided in several publications of the World Health Organization [31,34].

Community-based intervention programmes

Accurate and relevant information on risk factors and on healthy choices should be a fundamental right. It is imperative to ensure the provision of this information to all individuals. Particular emphasis should be placed on education of children and adolescents at school. A well organized national health education system is a cornerstone of any intervention programme [35].

What is needed is not only the information on what causes the three major NCDs, but also practical information on how to avoid these causes. Individuals should be taught practical skills on how to adopt and follow healthy practices, such as what sort of food to buy and how to prepare meals. People and communities should also be taught the skills for support measures needed for such lifestyles [35].

However, providing information is not enough. People's health-related lifestyles

in any community are closely related to the general lifestyles of the community and to the general beliefs, norms and social values. Thus, it is often difficult for the individual to make major changes in lifestyle, if respective changes do not take place in the community and, more generally, in society as a whole. Therefore, successful large-scale preventive programmes attempt to change, not so much the individuals, but the whole community and many of its social and environmental factors. This involves decisions and actions that make healthy choices possible and easy. People are responsible for themselves, but intervention programmes and decision-makers should ensure that people can make informed choices and that following healthy lifestyles is a feasible option. Government departments other than the ministry of health need to be involved in a highly coordinated manner. Nongovernmental organizations should also be involved and, ultimately, mobilization of the whole community is needed.

Carefully designed community programmes should form a link between the basic health research and the large-scale public health programmes and governmental policies. Such community programmes thus form a "model" for testing the approach for nationwide use. From an epidemiological point of view, the strength of the community approach (population approach) is that it is more effective in reducing disease rates in the community than restricted, but more intensive, interventions among high-risk individuals alone.

An example of a successful programme is the Finnish experience with the North Karelia Project [35]. Finland had an exceptionally high mortality rate of coronary heart disease in the 1960s. Based on public concern and a specific petition from the province of North Karelia, the North Kare-

lia Project was formulated and launched in 1972. Initially, the project was planned together with WHO to be a five-year pilot project for prevention and control of CVDs. The strategy and contents of this comprehensive community-based intervention programme were designed in light of the previously mentioned considerations. Twenty years' experience in this programme demonstrated marked reductions in the population levels of the main risk factors: e.g. among 30–59 year-old males, prevalence of smoking decreased from 52% to 32%, mean serum cholesterol from 7.0 mmol/l to 5.6 mmol/l and mean blood pressure from 147/94 to 142/84. These reductions took place particularly in the 1970s and again in the late 1980s with continued intervention efforts.

Lifestyle modification is the foundation for the prevention of NCDs and their complications and the basis of any intervention programme aimed at primary prevention. The importance of initiating such intervention programmes is now recognized by many Member States. The activities implemented in the area of NCD control have focused so far on secondary and tertiary prevention and there have been no plans that specifically aim at primary prevention. The community has enormous potential to bring about change. The establishment of a pilot project is the starting point. Such a project should aim to promote healthy lifestyles, particularly in the areas of tobacco use, dietary patterns and physical activity, and to reduce the risk factors in the community for CVDs, non-insulin-dependent diabetes mellitus and certain types of cancer. The community approach brings long-term benefits to the population as a whole as compared to initiatives that are led by experts. The notion of community will result in partnerships being formed between individuals and groups which have a synergis-

tic effect. Lifestyle modification requires environmental changes that can only be taken by society as a whole.

Within the pilot project, activities on smoking prevention should be based on a national plan for tobacco control that includes strategies for data collection, development of health education and information systems and other appropriate policies and legislation. For nutrition, strategies should include the development of methodologies to encourage healthy eating and policies that support social, economic and marketing environments conducive to healthy eating. Physical activity programmes should be based on policy, public information, education and training supported by standardized research and evaluation components. All strategies should aim at increasing physical activity in the population as a whole with special emphasis on children and women.

Priorities and approaches for prevention in the EMR

Given the magnitude of the NCD problem in the Region and its profound adverse impact on health and the economy, there is an urgent need for intervention and the initiation of preventive actions.

Member States should benefit from the experiences gained in NCD prevention and the lessons learnt in industrialized countries; however, the types and extent of NCDs differ from region to region, and available resources and socioeconomic and cultural factors vary from one country to another. These variations play a major role in influencing policies and in determining approaches and priorities that are region- and country-specific.

For these reasons, approaches and priorities for the prevention of CVDs, diabe-

tes and cancer in the EMR have been discussed during several intercountry meetings organized by the WHO Regional Office for the Eastern Mediterranean in the past five years. The conclusions arrived at in these meetings have been published in several regional publications and documents [11,14,32,33,36].

In conclusion, there is a pressing need for Member States to initiate national programmes aimed at the prevention of NCDs and reducing their enormous social and economic costs. As a preliminary phase of such programmes, national health authorities should promote the collection of data on the determinants, magnitude and impact of NCDs. Existing information systems should be strengthened with special emphasis on improving all aspects of mortality statistics. The development of pilot community-based projects for the prevention of NCDs should be seriously considered. Equally important is the need to assess the availability of minimum standards of health care for people with established CVD, diabetes and cancer. Appropriate measures should be taken to ensure the availability of the essential elements of health care at various levels of care at affordable costs. The role of primary health care in the prevention and management of NCDs should be strengthened.

Intercountry coordination and collaboration are vital. There is a need to establish a network of experts and institutions in the Region capable of responding to regional needs in terms of research, training and health care services.

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References

1. Murray CJ, Lopez AD. *The global burden of disease*. Harvard School of Public Health on behalf of the World Health Organization and the World Bank. London, Harvard University Press, 1996.
2. *Prevention in childhood and youth of adult cardiovascular diseases*. Geneva, World Health Organization, 1990 (WHO Technical Report Series, No. 792).
3. *EMRO: partner in health in the Eastern Mediterranean 1949–1989*. Alexandria, World Health Organization, Regional Office for the Eastern Mediterranean, 1991.
4. *The work of WHO in the Eastern Mediterranean Region, 1995. Annual report of the Regional Director*. Alexandria, World Health Organization, Regional Office for the Eastern Mediterranean, 1995.
5. Chen L, Hill A. *Oman's leap to good health*. Muscat, Oman, World Health Organization/United Nations Children's Fund, 1996.
6. *World development report, 1993*. Washington DC, World Bank, 1993.
7. *The world health report 1996. Fighting disease, fostering development*. Geneva, World Health Organization, 1996.
8. *Clinical disorders arising from dietary affluence in countries of the Eastern Mediterranean Region. Situation analysis and guidelines for control*. Alexandria, World Health Organization, Regional Office for the Eastern Mediterranean, 1990, (WHO EMRO Technical Publication No. 14)
9. Miladi S. Changes in food consumption patterns in the Arab countries. In: Musaiger AO, Miladi S, eds. *Diet-related non-communicable disease in the Arab countries of the Gulf*. United Arab Emirates, United Arab Emirates University and the Food and Agriculture Organization, 1996:16–33.
10. Binhemd T et al. Obesity in a primary health care centre: a retrospective study. *Annals of Saudi medicine*, 1991, 11:163–6.
11. *Cancer control in the Eastern Mediterranean Region*. Alexandria, World Health Organization, Regional Office for the Eastern Mediterranean, 1995 (EMRO Technical Publications Series, No. 20).
12. Al-Khateeb M. *A report on the regional situation*. Submitted to the Regional Consultation on Smoking Control. Alexandria, World Health Organization, Regional Office for the Eastern Mediterranean, December 1995.
13. Alwan A. Cardiovascular disease in the Eastern Mediterranean Region. *World health statistics quarterly*. 1993, 46:97–100.
14. Alwan AS. *Prevention and control of cardiovascular diseases*. Alexandria, World Health Organization, Regional Office for the Eastern Mediterranean, 1995 (EMRO Technical Publications Series, No.22).
15. Nissinen A et al. Hypertension in developing countries. *World health statistics quarterly*, 1988, 41:141–54.
16. *Vital statistics—annual report 1992*. Qatar, Ministry of Public Health, 1993.
17. *Health statistical abstract*. Bahrain, Ministry of Health, 1991.
18. *Annual statistical report*. Jordan, Ministry of Health, 1991.
19. Doghmi F et al. Fourteen years' experience with cardiac catheterization and angiography in Jordan. *Jordan medical journal*, 1989, 23:21–37.
20. Ibrahim M. Future of research in hypertension in developing countries. *Eastern*

- Mediterranean health journal*, 1996, 2(2):202-5.
21. *Manual on the management of hypertension in primary health care*. Oman, Ministry of Health, 1996.
 22. Sarraf-Zadegan N. *Hypertension in Isfahan*. Personal communication: data reported by the Cardiovascular Diseases Research Centre in Isfahan.
 23. Alwan AS. Studies on the prevalence of hypertension in Iraqi rural and urban communities. *Iraqi medical journal*, 1982, 29:99-104.
 24. Faruqi AMA. Heart disease in south Asia: experience in Pakistan. In: Hurst JW et al., eds. *Clinical essays on the heart*, vol 2 New York, McGraw-Hill, 1993.
 25. Mostafa AA et al. Prevalence of hypertension in south-western Saudi Arabia. *Eastern Mediterranean health journal*, 1996, 2(2):211-8.
 26. Alwan AS, King H. Diabetes in the Eastern Mediterranean (Middle East) Region: the World Health Organization responds to a major public health challenge. *Diabetic medicine*, 1995, 12(12):1057-8.
 27. Alwan AS. Epidemiological and clinical aspects of diabetes mellitus in the Eastern Mediterranean Region. *Eastern Mediterranean Region epidemiological bulletin*, 1994, 23:3-14.
 28. Asfour MG et al. High prevalence of diabetes mellitus and impaired glucose tolerance in the Sultanate of Oman: results of the 1991 national survey. *Diabetic medicine*, 1995, 12(12):1122-5.
 29. Elbagir MN et al. A population-based study of the prevalence of diabetes and impaired glucose tolerance in adults in northern Sudan. *Diabetes care*, 1996, 19(10):1126-8.
 30. Herman WH et al. Diabetes mellitus in Egypt—risk factors and prevalence. *Diabetic medicine*, 1996, 12(12):1126-31.
 31. *National cancer control programmes: policies and managerial guidelines*. Geneva, World Health Organization, 1995.
 32. *Prevention and management of hypertension*. Alexandria, World Health Organization, Regional Office for the Eastern Mediterranean, 1996 (EMRO Technical Publications Series, No. 23).
 33. Alwan, A. *Management of diabetes mellitus, standards of care and clinical practice guidelines*. Alexandria, World Health Organization, Regional Office for the Eastern Mediterranean, 1994 (unpublished document WHO-EM/DIA/6/E/G available from the Noncommunicable Diseases Unit, WHO EMRO, PO Box 1517, Alexandria 21511, Egypt).
 34. *Cancer pain relief and palliative care*. Geneva, World Health Organization, 1990 (WHO Technical Report Series, No. 804).
 35. Puska P. The North Karelia Project: nearly 20 years of successful prevention of cardiovascular diseases in Finland. *Hygiene*, 1992, 1:32-5.
 36. *Diabetes prevention and control. A call for action*. Alexandria, World Health Organization, Regional Office for the Eastern Mediterranean, 1993 (unpublished document WHO-EM/DIA/3/E/G available from the Non-Communicable Diseases Unit, WHO EMRO, PO Box 1517, Alexandria 21511, Egypt).