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Risk Factors and Cardiovascular Disease of Urban Population

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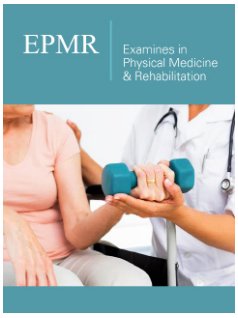

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Abstract

This article provides an overview of the global burden of cardiovascular disease. It discusses the increase in cardiovascular and other chronic diseases; and then provides estimates of the burden of cardiovascular diseases (CVD) with specific focus on the developing countries and the difference between rural and urban areas, the main differences being the different life-style, each one including specific risk factors. The second part of this article describes the burden of CVD by specific region or ethnic group, the relevant risk factors, and possible strategies for prevention.

Material and Methods

We tried to synthesise the scientific data available in various articles in order to provide an overall view of the impact cardiovascular diseases have on a global level and underlining the differences between social, economic, genetic end environmental risk factors.

General information

CVD is a major global health problem, especially in developing countries. Most of our information about prevention and treatment derives from studies conducted in developed countries and predominantly among white populations. In the meantime, as it is likely that most risk factors will be of some importance in all ethnic populations in the world, prevention and treatment strategies that have been proven to be effective in developed countries should be adapted for developing countries. These strategies should include prevention of the development of risk factors in the population by changes in social and governmental policy [1]. Some approaches are relatively low cost and easily applicable (such as promoting physical activity, use of aspirin, or angiotensin-converting enzyme inhibitors in high risk patients and blood pressure management), whereas others may only be applicable to relatively affluent sections of some societies (statins or coronary artery bypass graft surgery) [2]. Therefore, both population-level and individual-level strategies should be tailored to each country, community, and socioeconomic stratum.

Epidemiology

Life expectancy at birth has increased from a global average of 46 years in 1950 to 66 years in 1998 [3]. With industrialization, the major causes of death and disability, in the advanced countries, have shifted from a predominance of nutritional deficiencies and infectious diseases, to chronic diseases such as cardiovascular disease (CVD), cancer, and diabetes. For countries in the earliest stage of development, the most common circulatory diseases are rheumatic heart disease, those due to other infections, and nutritional deficiency–related disorders of the heart muscle [4]. During the second stage, as infectious disease burdens are reduced and nutrition improves, diseases related to hypertension, such as haemorrhagic stroke and hypertensive heart disease, become more frequent. Regions experiencing this phase include China and other Asian countries. During the third stage, as life expectancy continues to improve, high-fat diets, cigarette smoking, and sedentary lifestyles become more common. During the fourth stage, increased efforts to prevent, diagnose, and treat ischemic heart disease and stroke can delay these diseases to more advanced ages.

Global burden of cardiovascular disease

The high current burdens of non-communicable diseases (NCDs) are highlighted by the estimates provided by the Global Burden of Disease Study and in the World Health Report 1999 which indicate that NCDs contributed to 59% of global mortality (31.7million deaths) and 43% of the global burden of disease in 1998 [5]. Several NCDs such as cardiovascular diseases (CVD), cancers, diabetes, and chronic obstructive pulmonary disease are linked by common lifestyle factors such as diet, physical activity, and tobacco consumption. These four disorders together contribute to about 50% of global mortality, but because these conditions tend to affect individuals in middle and old age, they account for a smaller proportion (19%) of the global burden of disease [6]. It is estimated that 30.9% of all deaths in 1998, as well as 10.3% of the total disease related burden, in terms of disability adjusted life year loss (DALY loss) were attributable to CVD [7]. The high burdens of CVD in developing countries are attributable to the increasing incidence of atherosclerotic diseases, perhaps due to urbanization and higher risk factor levels (such as obesity, diabetes, dyslipidaemia, hypertension, etc.), the relatively early age at which they manifest, the large sizes of the population, and the high proportion of individuals who are young adults or middle-aged in these countries. For example, about half of the deaths attributable to CVD in the developing countries in 1990 occurred below the age of 70 years, in contrast to about a quarter in the developed countries. Such a pattern of premature CVD mortality is likely to affect the developing countries even more in the future. Between 1990 and 2020, the increase in ischemic heart disease (IHD) mortality (120% in women and a 137% in men) in the developing countries is expected to be much greater than among developed countries (29% and 48%, respectively) [8]. In many populations, both control and cohort studies have been performed, which have shown that a few markers are associated with CVD, presenting a higher risk or on the contrary, lower risk. To distinguish whether these associations are correct, it has been decided to develop and apply certain criteria that refer to evidence from randomized clinical trials and evidence from experimental studies. To all these, criteria such as association coherence, association strength, dose-response relationship, temporal relationship, and biological plausibility have been added.

Lag effect

The effect of several risk factors for vascular disease may take several years to fully manifest, therefore cohort studies of relatively short duration may only identify a part of this effect, while extended studies could uncover a larger effect. For example, the study of cigarette smoking in British doctors revealed a stronger relative risk in the 40 year follow up than in the initial 20-year follow up [9]. Similarly, trials of lipid lowering interventions have demonstrated only a modest impact in preventing CHD during the first year or two of the trials, but there was a substantially greater impact in the fourth and fifth years, [10,11] with the possibility that larger differences may have been evident with more prolonged intervention. The inability to quantify exposure to a risk factor in the individuals classified as unexposed leads to an underestimation of the differences in exposure, between those exposed to a risk factor compared with those unexposed, as in the case of tobacco smoke. For example, in most studies, non-smokers include passive smokers [12]. When passionate smokers are included in this category, the risks of an active smoker, as compared to true non-smokers, can be underestimated. This suggests that the total impact attributed to a particular risk factor may have been considerably underestimated, so that the true impact of fully modifying currently proven risk factors is likely to be much greater than currently recognized.

Variations in disease rates by ethnicity and geography: general considerations

Ethnicity (unlike race) is a construct that encompasses both genetic and cultural (meaning language, religion, diet) differences. Because individuals of different ethnic backgrounds tend to live in distinct regions and societies, variations in disease rates by ethnicity are also intertwined with geographic differences. Furthermore, specific ethnic groups within one location adopt certain lifestyles, whereas the same ethnic group in another location may adopt substantially different lifestyles. Consequently, any study of variations in disease by different ethnic groups is also intertwined by additional variations in lifestyle, geography, socioeconomic status, etc.

Europe: People of European origin include those who originate from diverse backgrounds in Northern Europe (Nordic countries), Western Europe (e.g., United Kingdom and France), Southern Europe (e.g., Spain and Italy), and Eastern Europe (e.g., Poland and Ukraine). Among European populations, the CVD is mainly attributable to classical risk factors, such as diets high in saturated fats, elevated serum cholesterol and blood pressure (BP), diabetes, and smoking. In Eastern European countries, the epidemic of CVD is partly related to high levels of smoking and excessive alcohol use along with diets high in saturated fat [13] and poor social conditions. Numerous researches have been done to explain why Italian and French populations remain protected by CHD. Consumption of high saturated fat, such as olive oil and antioxidants, is believed to be responsible for the low CHD rates in Italy. The CHD mortality rate in France, remains very low [14]. According to the WHO, the cardiovascular disease mortality rate is six times higher among men and women in the Russian Federation than in France.

In 1996, the ASMR for male coronary heart disease (CHD) in the France was 60/100 000 compared with 390/100 000,000 men in Russian Federation. Also, the cerebrovascular disease (CBVD) ASMR was 40/ 100 000 among males in France, compared with 244/100 000 in the Russian Federation compared with 40/100 000 in France [15].

India: An important increase in CHD prevalence and risk factors is seen in urban India compared to rural areas [16]. A recent overview of prevalence surveys conducted over 2 decades in India reported a 9-fold increase of CHD in urban centres, compared with a 2-fold increase in CHD rates among rural populations [17]. In urban areas, elevation of CHD rates is associated with an increase in the prevalence of lipid and glucose abnormalities, as well as hypertension and obesity. By contrast, the rates of tobacco smoking are higher in rural compared with urban populations.

Chinese: In China, mortality rates (particularly CHD) have been increasing and is approximately the same as that in the US. Also. The CHD mortality rates are 50 % lower than the rates observed in most eastern countries [18]. In the Chinese, the intracerebral haemorrhage, occurs between 2 and 3 times more frequently than in white Caucasians [19].

Japan: Since the economy in Japan has improved, the incidence of CVD has declined compared to that in the western countries. Mortality rates from CHD have traditionally been much lower in Japan than in western countries [15]. In Japan, the ASMR for CHD in males is 43/100 000 and in females is 22/100 000, which is one-fourth the rate of CHD in North America, and for CBVD is 72/100 000 and 46/100 000 among males and females, respectively [15]. Usually, observing the differences in the rates and risk factors of certain diseases between countries gives us the first indication that ethnic variation in diseases burden exists (Figure 1). For example, in the Seven Countries Study [20,21] low CHD rates were observed in Japan and the Mediterranean countries, and high CHD rates in Finland and the US. The variation in diet, serum cholesterol, and blood pressure largely explain these differences. Recent databases on a revised WHO standard population demonstrates a greater than 10-fold difference in age standardized mortality rates among men and women in different countries [22]. Figure 1 Variations in the rates of cardiovascular disease (CHD) between ethnic groups in Canada [20] Several factors may contribute to these observed interpopulation differences in the CVD profile. In the first place, countries could be experiencing different stages of epidemiologic transition, with diverse demographic profiles, varied life expectancy, and differing contributions from competing causes of death [23]. Secondly, environmental factors related to CVD risk differ widely across populations and may be partly related to the stage of industrialization and culture [24]. Thirdly, the variance in the risk of incident CVD within populations may be explained by different genetic risk factors. These risk factors provide the basis for differences in individual susceptibility in a shared and relatively homogenous environment. They also contribute to interpopulation differences, due to variable frequencies of one or more genetic determinants of risk in different ethnic groups. Fourthly, the "programming" effect of factors promoting selective survival may also determine individual responses to environmental challenges and, thereby, contribute to the population differences in CVD. Fifth, other factors that could determine population differences in CHD are represented by intrauterine, infantile nutrition and early childhood [25]. Due to poor maternal nutrition, an adverse intrauterine growth environment may confer a selective survival advantage to the foetus who has been programmed for reduced insulin sensitivity. Therefore, differences in environmental factors, demographic profiles, early childhood programming influences as well as differences in gene frequency or expression can all contribute to variations in CVD between different populations.

Urbanization and changing diets: Urbanization has been associated with some of the most dramatic environmental and social changes. The rates of urbanization are increasing globally, from 36.6% of the world population living in urban areas in 1970, to 44.8% in 1994 [26]. Soon it will increase to 61.1% by 2025. With urbanization, there is a marked increase in consumption of energy rich foods, a decrease in energy expenditure (through less physical activity) and a loss of the traditional social support mechanisms. Rural areas are also going through a transformation, in addition to increased migration of individuals from rural to urban areas. For instance, increased mechanization in agriculture and increased use of automobile and bus transportation in rural areas are leading to a decrease in physical activity. At the same time, global influences (via television or increased availability of processed food) on lifestyles perceived to be desirable or modern are changing the types of food consumed in both urban and rural areas.

Conclusion

Over the 20th century, most countries in the world have experienced great change in social structures, economics, politics, education, and home environments. These economic and social transitions have resulted in major changes in population demography, industrial structure, income levels, expenditure patterns, family structures, education levels, physical activity and eating habits. These changes have dramatically increased CV risk factors and disease rates. CVD is a major global health problem, especially in developing countries. It is likely that most risk factors will be of some importance in all ethnic populations in the world, prevention and treatment strategies that have been proven to be effective in developed countries should be adapted for developing countries. These strategies should include approaches to prevent the development of risk factors in the population by changes in governmental and social policy as well as approaches that can be applied to high risk individuals. Translating our current knowledge of CVD prevention into effective implementation could be expected to substantially diminish or even reverse the current and future global epidemic of CVD.

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