HOSTED BY

Contents lists available at ScienceDirect

Asian Pacific Journal of Tropical Biomedicine

journal homepage: www.elsevier.com/locate/apjtb

Document heading doi: 10.12980/APJTB.4.201414B401

Changing trends of cardiovascular risk factors among Indians: a review of emerging risks

Arun Kumar*

Department of Biochemistry, Manipal College of Medical Sciences, Pokhara, Nepal

ARTICLE INFO

Article history:
Received 20 Sep 2014
Received in revised form 9 Oct 2014
Accepted 12 Oct 2014
Available online 15 Oct 2014

Keywords:
Cardiovascular risk factors
Genetic predisposition
Modifiable risk
Non-modifiable risk
Indians

ABSTRACT

The global burden of disease due to cardiovascular diseases (CVDs) is escalating, and the changing trends of CVD risk factors are identified among Indians experiencing rapid health transition. Contributory causes include: growing population with demographic shifts and altered age profile, socio-economic factors, lifestyle changes due to urbanization. Indians are also having genetic predisposition to cardiovascular diseases and adult are susceptible to vascular disease linking possible gene-environment interactions influencing ethnic diversity. Altered diets with more of junk foods along with diminished physical activity are additive factors contributing to the acceleration of CVD epidemics, along with all form of tobacco use. The pace of health transition, however, varies across geographical regions from urban to rural population with consequent variations in the relative burdens of the dominant CVDs. A comprehensive public health response must be looked to plan over all strategies to integrate policies and programs that effectively impact on the multiple determinants of CVDs to provide protection over the life span through primordial, primary and secondary prevention. Populations as well as individuals at risk must be protected through initiatives, enable nutrition-based preventive strategies to protect and promote cardiovascular health.

1. Introduction

The global population is projected to rise by 20% from 6.7 billion to 8.1 billion by 2030, but the crude death rate is expected to remain stable at around 8.4 deaths/thousand. However, a major shift is currently underway in the overall disease burden in the world. In 2008, five out of the top ten causes for mortality worldwide were non-communicable diseases (NCDs), which have figured out to be seven out of ten by the year 2030 and majority resides in the developing countries. It is projected that, by the year 2030, about 76% of the deaths in the world would be due to NCDs[1].

Cardiovascular diseases (CVDs) were once thought to be the disease impacting the rich and affluent community, but it is now well established that they afflict the poor as well[2]. Due to urbanization there is a changing trend in lifestyles, blue collar and high demanding jobs, unhealthy eating habits and less physical activity are the key reasons for high incidence rates in the rich population. These diseases not only affect the well being, but can also retrain the economic growth of the country due to increased healthcare expenditure and diminished productivity.

Even there is increasing availability and focus on curative care in urban areas, this alone cannot clear up the problem of CVDs. The need of the hour is to focus on prevention and its early diagnosis and management and it is not that the health care providers alone can tackle this problem. There is an urgent need for the urban planners, educational institutions, employers, food and beverage industries, wellness and fitness players and above all the government policies to take up the challenge and work towards behaviour and lifestyle changes through positive and negative reinforcements.

In rural India, it is relatively more complex to solve this problem as it needs to create and improve awareness, access and affordability to all in the society. The lack of awareness coupled with the inadequate access to diagnosis leads to a very large number of patients needing tertiary care. The shortage of such high end facilities as well as their inability to pay, leads to high mortality among the rural population.

To solve this problem, urgent development is required to cross the cardiac value chain and collaboration with health care sectors including the Government, pharmaceutical companies, medical technology firms and health insurers. Recent developments have taken place in this direction, with the Government launching the

*Corresponding author: Dr. Arun Kumar, Associate Professor, Department of Biochemistry, Manipal College of Medical Sciences, Pokhara, Nepal.
Tel: +977-9816664537
E-mail: arun732003@gmail.com
Foundation Project: Supported by a grant from Confederation of Epidemiological Associations registered under Govt of Kerala (Grant number: 30-956/2013 CEA).

National NCD programme which would focus on prevention and awareness, and sporadic examples of innovations in medical and mobile technology that allow early detection and monitoring.

2. Global prevalence of CVDs

CVDs comprise of the disorders of the heart and blood vessels and commonly include multifactorial heterogenous conditions such as hypertension, coronary heart disease (CHD), stroke, congestive heart failure, cerebrovascular disease, peripheral arterial disease, rheumatic heart disease, deep vein thrombosis and pulmonary embolism. CVDs are the leading cause of deaths globally with maximum deaths annually. In 2008, CVDs represented 30% (17.3 million) of all deaths globally[3]. CHD and stroke accounted for 7.3 million and 6.2 million deaths of all the global deaths from CVDs, respectively[4]. The projected deaths from CVDs, mainly from heart disease and stroke have been estimated to reach 23.3 million by 2030[5].

3. Prevalence of CVDs in Indian subcontinent

Eighty percent of CVD related deaths are being reported from low and middle income countries like India[3]. The incidence of CVD is increasing everyday and 25% of all mortality is due to coronary artery disease. Population surveys from India have reported 9-fold increase in its prevalence and expected to cause doubling of deaths due to CVD by 2015 (Figure 1)[6].

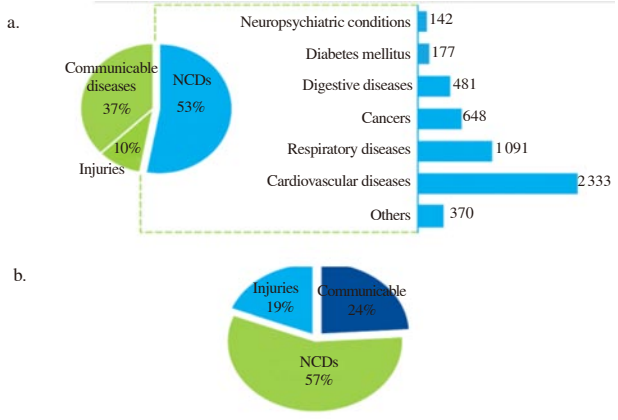

Figure 1. Prevalence of CVDs in India.
a: Deaths in 2008 due to CVDs; b: Estimated disease burden in India by 2020.

4. Indians and cardiovascular risk

The concept of cardiovascular risk factors was first introduced in 1961 from the Framingham Heart Study, linking the presence of specific parameters like elevated cholesterol, hypertension, diabetes mellitus, tobacco use. Asian Indian lineage accounts for over one-fifth of the world population[7]. Asian Indian phenotype is marked by combination of clinical (larger waist-to-hip and waist-to-height ratios signalling excess visceral adiposity), biochemical [insulin resistance, lower adiponectin and higher C-reactive protein (CRP) levels], and metabolic aberrations [raised triglycerides (TGs), low- and high-density lipoprotein-cholesterol (HDL-c)][8]. The growing prevalence of heart diseases in India can be attributed to presence of high lipoprotein, environmental and lifestyle risk factors in Indian population[8,9]. Inclinations to metabolic syndrome is another important reason for higher incidences of CVD in Indian population[8,10].

5. Genetic pre-disposition among Indians in the development of CVDs

Several studies have documented that mutation in specific genes result in early development of CVDs. On genetic analysis of hyperlipidemic patients a correlation was found in the development of CVD due to interaction of inherited hyperlipidemic genes and environmental factors like stress, unhealthy diet, smoking and sedentary life styles[11].

Some important CVD associated genetic variants are discussed below.

5.1. Lipoprotein associated genes

5.1.1. Lipoprotein lipase (LPL) gene

This gene is located on chromosome 8p22. It produces an enzyme LPL, which hydrolyses TG rich lipoproteins, thus clearing the latter from circulation. The occurrence of four different substitution mutations, *viz*., Gly^{188}Glu, Asn^{291}Ser, Asp^{9}Asn and Ser^{447}Ter has been reported in different studies[11]. The Asn^{291}Ser substitution increases risk of myocardial infarction and also severity of atherosclerosis[12]. According to a meta-analysis, substitutions in Gly^{188}Glu, Asn^{291}Ser and Asp^{9}Asn support an atherogenic lipoprotein profile with disease risk in heterozygous carriers of Gly^{188}Glu, and borderline risk in other two types. However, the Ser^{447}Ter showed an opposite trend. For the first three substitutions this differential activity on lipoprotein profiles maybe because the mutations occur at N terminal end (responsible for the enzyme catalytic activity). Contrary to this, Ser^{447}Ter substitution occurs at the C terminal end and thus possibly influences uptake of lipoproteins by receptors[13].

Hypertension is one of the major risk factors for CVDs. LPL provides fatty acids (FA) through TG hydrolysis as the energy substrate for cardiac cells. A variant X447, in which two amino acids are deleted from the C terminal, is more efficient in TG hydrolysis thus providing protecting against CVD by sustaining low levels of TG and FA. However, in hypertensive individuals with the variant X447, even though the TG levels are lower than those hypertensives with normal S447, the FA levels are significantly higher. Subsequently, an overburden of uncleared FA results in an increased risk of CVD[14].

5.1.2. Low density lipoprotein receptor genes (LDLR)

LDLR gene is located on chromosome 19. Mutation in *LDLR* gene causes familial hypercholesterolemia, which is dose dependent autosomal dominant disorder, occurs at less than 60 years of age[15]. Atherosclerosis susceptibility, also known as atherogenic lipoprotein phenotype, is closely linked to LDLR locus.