**REVIEW ARTICLE**

# Risk Factors of Cardiovascular Disease in Developing Countries

*Farah Rehan[1], Alina Qadeer[1], Irfan Bashir[1,2] and Mohammed Jamshaid[1]

[1]Faculty of Pharmacy, University of Central Punjab, Lahore, Pakistan
[2]Foundation for Young Researchers, Pakistan

**ABSTRACT**

Cardiovascular diseases (CVDs) have increased the mortality rate both in developing as well as developed countries, however a lower trend in death rates have been seen in developed and high income countries like USA, UK, Australia, Japan and other European countries due to improved life style, better strategic implementation, control of disease both in young and adults and especially reduced smoking habits. In developing countries CVD become an alarming situation due to prevalence of disease in early age that later on become chronic and difficult to control. Various risk factors that can contribute toward CVD in developing countries include smoking, high alcohol and salt intake, dietary factors, diabetes, high blood pressure and psychosocial aspects such as stress, anxiety and depression. Various other factors such as family history and the gender difference also contributing towards the high risk of developing CVD.

*Key Words*: Mortality rate, epidemiology, prevalence, non-communicable diseases, psychosocial aspects, preventive measures.

## INTRODUCTION

CVDs now become main cause of demise among men and women (Anand *et al.*, 2008). Cardiovascular diseases (CVDs) normally include coronary heart disease (CHD), rheumatic heart disease (RHD), strokes, cardiomyopathy, and other heart diseases (Lopez *et al.*, 2006). According to WHO, 16.7 million people globally die of cardiovascular diseases each year in 2002 that represent about 1/3 of all deaths globally (Atun *et al.*, 2009) and it is not being realized that the developing countries become the major contributor in increasing the global burden of CVDs as compared to developed countries (Lopez, 1992).

## EPIDEMIOLOGY

Now a days, the domination of chronic diseases as main contributors to total global mortality has emerged (WHO, 2005). More than 80 percent of the deceases occurred in low and middle income countries. The World Health Organization (WHO) approximates that there will be about 20 million CVD deaths in 2015, that will account for 30 percent of all deaths worldwide (Beaglehole and Bonita, 2008). By the end of 2030, researchers estimate that non communicable diseases will account for more than three-quarters of deaths globally; CVD alone will be responsible for more deaths in low income countries than infectious diseases including HIV/AIDS, tuberculosis, and malaria, maternal and perinatal conditions, and nutritional disorders combined (Alwan *et al.*, 2010). So now, CVD is the largest single contributor to global mortality and will continue to control mortality drifts in the future (Fuster, V and Kelly, 2010). CVD was once considered to be the disease of developed countries but now it is affecting not only industrialized nations but also low and middle income countries, where it accounts for nearly 30 percent of all deaths. The adoption of dietary habits from western countries, increased childhood obesity, physical inactivity, and increased smoking due to increased urbanization, globalization and development, and now affects regions which are once at low. On the other hand, control of infectious diseases through proper vaccination and an improved childhood nutrition has increased the average span of life of many people in many low and middle income countries that resulted in emerging of CVD in older people as chronic disease (Gaziano *et al.*, 2010). 82% increase in coronary heart disease mortality will likely to occur in developing countries in near future not only because of the high levels of risk factors, but also due to the relatively earlier onset of disease among largely young and middle-aged people (WHO, 2005).

## PREVALENCE OF CVD IN DEVELOPED AND DEVELOPING COUNTRIES

According to WHO, CVD has no limitation related to gender, geographic, socioeconomic conditions. It can affect people of any age, sex and class (Atun *et al.*, 2009). Even though the strokes death in developing countries was 5 times more than in developed countries (WHO, 2009). The lower socioeconomic groups of developed countries have a higher occurrence of risk factors, prevalence of disease, and mortality rate. Globally CVD not only affecting men but it is also the main cause of death in women too (Mirzaei *et al.*, 2009). Death rates from coronary heart disease has shown decline in North America and many western European countries. Especially a strong study from Latin America, that include countries like Chile, Argentina, Cuba, and Brazil have shown a significant declines in death rates that resulted from CHD between 1970 and 2000. In low income countries, except Argentina, although the rates declined by more than 60 percent between 1970 and 2000 but it was less intense (between 20 and 45 percent) when compared with high income countries and that decline occurred more in the 1980s and 1990s. However in Mexico death rates resulting from CHD is increasing by more than 90 percent between 1970 and 2000 (Deaton *et al.*, 2011). Rise and fall pattern in the CHD mortality rate have been observed in some high income Asian countries like Singapore, while in other countries like the Philippines and urban China death rates seems to be increasing (Lloyd-Jones *et al.*, 2010). Even

*Corresponding Author:
Farah Rehan
Faculty of Pharmacy
University of Central Punjab
Lahore, Pakistan
E-mail: *frehan1986@gmail.com*
Contact No.: +92 334 411 6775

ICPJ Online

though the accurate data for most of Africa is not yet accessible, a report from South Africa has shown a significant rise in mortality rates for CVD and diabetes (Mirzaei *et al.*, 2009). According to INTERHEART Study, the average age of patients in South Asia having acute myocardial infarction (AMI) is 52 years, while in European and North American cohorts, it is 60-65 years due to better prevention, diagnosis, and management, reduced cigarette smoking especially in adults, and lower average blood pressure and blood cholesterol levels (Yusuf *et al.*, 2004).

Disability-adjusted life years (DALYs) lost means loss of healthy years of life. They specify the total burden of a disease, as compared to simply the resulting deaths. Cardiovascular disease accounts for 10% of DALYs lost in low- and middle-income countries and 18% in high income countries. Coronary heart disease burden rise from around 47 million DALYs globally in 1990 to about 82 million DALYs in 2020. In China the DALYs lost per 1000 population, age-standardized estimates for 2002 is 0-9 while in Pakistan, Saudi Arabia and Iran is 10-19 while in India it is 20-29 and in Afghanistan it is 30 and above (Jha and Chaloupka, 1999).

CVD is becoming a worldwide health problem that requires a global effort for its prevention and management. Its influence is highest in developing countries because they lack expertise both in professional and financial department to prevent and manage CVD (Mathers and Loncar, 2006).

## PRIMARY RISK FACTORS OF CVD

Risk factors that can lead to CVD in both men and women includes excessive intake of tobacco, oil, salt and alcohol. Also diabetes, high blood pressure and low physical activity also contributes towards heart stroke. In addition to that, emotional factors such as stress and anxiety and also the environmental issues playing significant part to increase the rates of CVD in developing countries.

**Use of Tobacco:** More than 1 billion smokers are observed around a world. Even though Tobacco products utilization has shown a decreasing trend in high income countries but increasing globally, as in in low and middle income countries, more than 80 percent of the world's smokers reported (King *et al.*, 2012). Annually around 5.4 million people are dying due to smoking, this figure is more than the deaths occurring due to infectious diseases like tuberculosis (TB), malaria and HIV and responsible for mortality in 1 out of 10 adult globally(Mathers and Loncar, 2006). Secondhand smoke contact increases cardiovascular risk by 25 to 30 percent and also cause AMI, because with the ban of smoking a significant reduction in the rate of AMIs from 6 to 47 percent is reported (King *et al.*, 2012).

**Impact of High Risk Diet:** The relationship between CVD and diet has been largely studied in epidemiology. Although nutritional research has usually focused on the effect of individual food groups on CVD, however in recent years different types of dietary patterns and their effect on CVD risk were also studied. Like reducing saturated fat intake, maintaining low to moderate intake of alcohol, and increasing the consumption of linoleic acid, fish and fish oils, vegetables and fruits, and potassium along with intake of whole grains, seeds, nuts and beans decline the risk of developing CVD. While the use of myristic and palmitic acids, transfatty acids, high sodium, and heavy alcohol and obesity have increased the risk of CVD both in developed and developing countries (Who and Consultation, 2003).

**Oil Intake:** Developing countries that usually have high levels of oil intake should ensure affordable supplies of healthy oils at economical prices. Countries like Argentina, Brazil, Chile, and Turkey slightly improved the accessibility of healthful oils at low price through oilseed plantation and production developments (Fuster and Kelly, 2010).

**Excessive Use of Salt:** Excessive sodium intake increases CVD risk significantly while through reduced sodium intake, a significant decrease in CVD burden is reported. High sodium intake increases our blood pressure that is confirmed through various epidemiological, animal, studies, and genetic studies. In addition to that reductions in sodium intake lead to declines in systolic and diastolic blood pressure that reduces heart attacks and strokes (He and MacGregor, 2009).

**Alcoholism:** Alcohol is one the largest preventable risk factors in low and middle income countries, accountable for most of the diseases worldwide (Rehm *et al.*, 2009). WHO has suggested some alcohol control interventions that are now being considered as a worldwide strategy. These include "pricing policies, restricting the intake of alcohol, drunk-driving rules, restrictions on marketing, awareness and education, and access to effective treatment" (WHO, 2010)

**Reduced Physical Activity**: Few studies reported the reason of declining levels of physical activity in developing countries. However a study conducted in China estimates 32 percent decline in average weekly physical activity among adults due to fast urbanization particularly through better transport and housing set-up and industrialization. Meanwhile, sitting behaviors like prolonged television watching also increased dramatically. Both health professionals and researchers suggested physical activity in order to reduce the global burden of chronic diseases and to increase the energy source of population (Ng *et al.*, 2009). Remaining physically inactive ultimately leads towards obesity which is steadily increasing during the past years both in developed and developing countries. WHO and FAO also came to the point that significant increase in weight could raise the risk of CVD substantially (Fernandez *et al.*, 2012).

**Biological Factors:** Such as lower levels of high-density lipoprotein (HDL) cholesterol and high levels of low-density lipoprotein (LDL) cholesterol cause an increase trend in CHD risk (Kannel *et al.*, 1969). The high levels of triglycerides also increase CVD risk (Gotto, 2005). According to the INTERHEART study the abnormal blood lipids levels are causing myocardial infarction (MI) globally and become the most important risk factor that can cause MI (Yusuf *et al.*, 2004) A reductions in saturated fat intake along with careful cholesterol monitoring and treatment can decrease the CVD risk (Puska *et al.*, 2009). Another biological factor includes the high blood pressure that causes 6 million deaths annually and accounts for 13.5 percent of global deaths annually (Lawes *et al.*, 2008).

**Intolerance to Glucose**: Diabetes is common and significant contributor to CVD risk. International Diabetes Federation's Diabetes Atlas 2010 estimates that global prevalence of diabetes will be nearly 285 million people aged 20 to 79 years of which some 70 percent belongs to developing countries (Shaw *et al.*, 2010) It was reported that 83 percent of all diabetes deaths happen in low and middle income countries (WHO, 2009).

**Gender Specific Occurrence**: Despite the fact that CVD affects men more predominantly, it is the leading cause of death among both men and women worldwide (Blauwet and Redberg, 2007). The INTERHEART study reported that on average, women have their first MI 9 years later than men. A recent review of stroke epidemiology estimated that that men experience their first stroke 4.3 years earlier than women (Anand *et al.*, 2008).

**Psychological and Social Aspects:** Psychosocial dynamics that can increase CVD risk include stress, anxiety, depression, anger, and lack of peer support. Psychosocial factors have also promoted some unhealthy behaviors like smoking, heavy alcohol intake, physical inactivity, poor diet and non-adherence to medicines, that all contribute to indirect increase in CVD risk (Everson-Rose and Lewis, 2005).

**Family History:** Genetic link with CVD is supported by the fact that the family history of CVD can increase your risk of having heart diseases. Several single-gene disorders that can cause CVD have been reported such as mutations of the Apo lipoprotein B gene is related to certain forms of familial hypercholesterolemia. The pathophysiology of CVD become more understandable after the identification of genetic loci such as 9p21which is found to be associated with CVDs (Arking and Chakravarti, 2009).

## PREVENTIVE MEASURES

Certain preventive measures can decrease your risk of developing CVD such as reduce or stop smoking, maintain your blood cholesterol level, your total should be less than 200 mg/dL, maintain your blood pressure at 120/80 mmHg, maintain a healthy weight and healthy life style by making yourself physically active throughout the day, manage your diabetes, reduce your stress level, limit your alcohol intake (approximately up to one drink for women or two drinks for men per day) and do a regular exercise daily to make your heart pumping at regular rate (JPS Health Network).

## CONCLUSION

Globally both men and women are at moderate or high levels of risk for developing CVD in young or adult age, and both the biological and social risk factor will increase the worldwide burden of cardiovascular diseases. Mainly due to the unhealthy diet, smoking, decreased physical activity and lot more factors especially in developing countries. Availability of insufficient data in developing countries has led to inadequate world wide effort to control CVD in low income areas although it can be easily controlled through proper screening and treatment. Preventive measures both primary and secondary are needed to control and better manage heart diseases both in early child hood to middle age population.

## REFERENCES

Alwan, A., MacLean, D. R., Riley, L. M., d'Espaignet, E. T., Mathers, C. D., Stevens, G. A., & Bettcher, D. (2010). Monitoring and surveillance of chronic non-communicable diseases: progress and capacity in high-burden countries. The Lancet, 376(9755), 1861-1868. [DOI]

Anand, S. S., Islam, S., Rosengren, A., Franzosi, M. G., Steyn, K., Yusufali, A. H., & Yusuf, S. (2008). Risk factors for myocardial infarction in women and men: insights from the INTERHEART study. European heart journal, 29(7), 932-940. [DOI]

Arking, D. E., & Chakravarti, A. (2009). Understanding cardiovascular disease through the lens of genome-wide association studies. Trends in genetics, 25(9), 387-394. [DOI]

Atun, R., de Jongh, T., Secci, F., Ohiri, K., & Adeyi, O. (2009). Integration of targeted health interventions into health systems: a conceptual framework for analysis. Health policy and planning, czp055. [DOI]

Beaglehole, R., & Bonita, R. (2008). Global public health: a scorecard. The Lancet, 372(9654), 1988-1996. [DOI]

Blauwet, L. A., & Redberg, R. F. (2007). The role of sex-specific results reporting in cardiovascular disease. Cardiology in review, 15(6), 275-278. [DOI]

Deaton, C., Froelicher, E. S., Wu, L. H., Ho, C., Shishani, K., & Jaarsma, T. (2011). The global burden of cardiovascular disease. European Journal of Cardiovascular Nursing, 10(2 suppl), S5-S13. [DOI]

Everson-Rose, S. A., & Lewis, T. T. (2005). Psychosocial factors and cardiovascular diseases. Annu. Rev. Public Health, 26, 469-500. [DOI]

Fernández, M. G., Izquierdo, J. Q., Marset, J. B., Lesmes, I. B., Sala, X. F., & Salas-Salvadó, J. (2012). Evidence-based nutritional recommendations for the prevention and treatment of overweight and obesity in adults (FESNAD-SEEDO consensus document). The role of diet in obesity prevention (II/III).Nutr Hosp, 27(3), 800-832.

Fuster, V., & Kelly, B. B. (2010). Epidemiology of cardiovascular disease.

Fuster, V., & Kelly, B. B. (Eds.). (2010). Promoting cardiovascular health in the developing world: a critical challenge to achieve global health. National Academies Press.

Gaziano, T. A., Bitton, A., Anand, S., Abrahams-Gessel, S., & Murphy, A. (2010). Growing epidemic of coronary heart disease in low-and middle-income countries. Current problems in cardiology, 35(2), 72-115. [DOI]

Gotto, A. M. (2005). Evolving concepts of dyslipidemia, atherosclerosis, and cardiovascular disease: the Louis F. Bishop Lecture. Journal of the American College of Cardiology, 46(7), 1219-1224. [DOI]

He, F. J., & MacGregor, G. A. (2009). A comprehensive review on salt and health and current experience of worldwide salt reduction programmes.Journal of human hypertension, 23(6), 363-384. [DOI]

Jha, P., & Chaloupka, F. J. (Eds.). (1999). Curbing the epidemic: governments and the economics of tobacco control. World Bank Publications.

JPS Health Network, Preventive Measures for Heart Health Accessed on: 30-June-2016 [Link]

Kannel, W. B., Dawber, T. R., Kagan, A., Revotskie, N., & Stokes, J. (1961). Factors of risk in the development of coronary heart disease—six-year follow-up experience: the Framingham Study. Annals of internal medicine, 55(1), 33-50. [DOI]

King, B. A., Dube, S. R., & Tynan, M. A. (2012). Current tobacco use among adults in the United States: findings from the National Adult Tobacco Survey.American journal of public health, 102(11), e93-e100. [DOI]

Lawes, C. M., Vander Hoorn, S., & Rodgers, A. (2008). Global burden of blood-pressure-related disease, 2001. The Lancet, 371(9623), 1513-1518. [DOI]

Lloyd-Jones, D., Adams, R. J., Brown, T. M., Carnethon, M., Dai, S., De Simone, G., ... & Go, A. (2010). Heart disease and stroke statistics—2010 update A report from the American Heart Association. Circulation, 121(7), e46-e215. [DOI]

Lopez, A. D. (1992). Assessing the burden of mortality from cardiovascular diseases. World health statistics quarterly. Rapport trimestriel de statistiques sanitaires mondiales, 46(2), 91-96

Lopez, A. D., Mathers, C. D., Ezzati, M., Jamison, D. T., & Murray, C. J. (2006). Global and regional burden of disease and risk factors, 2001: systematic analysis of population health data. The Lancet, 367(9524), 1747-1757. [DOI]

Mathers, C. D., & Loncar, D. (2006). Projections of global mortality and burden of disease from 2002 to 2030. Plos med, 3(11), e442. [DOI]

Mayosi, B. M., Flisher, A. J., Lalloo, U. G., Sitas, F., Tollman, S. M., & Bradshaw, D. (2009). The burden of non-communicable diseases in South Africa. The Lancet, 374(9693), 934-947. [DOI]

Mirzaei, M., Truswell, A. S., Taylor, R., & Leeder, S. R. (2009). Coronary heart disease epidemics: not all the same. Heart, 95(9), 740-746. [DOI]

Ng, S. W., Norton, E. C., & Popkin, B. M. (2009). Why have physical activity levels declined among Chinese adults? Findings from the 1991–2006 China Health and Nutrition Surveys. Social science & medicine, 68(7), 1305-1314. [DOI]

Puska, P., Vartiainen, E., Laatikainen, T., Jousilahti, P., & Paavola, M. (2009). The North Karelia project: from North Karelia to national action. National Institute for Health and Welfare= Terveyden ja hyvinvoinnin laitos (THL).

Rehm, J., Mathers, C., Popova, S., Thavorncharoensap, M., Teerawattananon, Y., & Patra, J. (2009). Global burden of disease and injury and economic cost attributable to alcohol use and alcohol-use disorders. The Lancet, 373(9682), 2223-2233. [DOI]

Shaw, J. E., Sicree, R. A., & Zimmet, P. Z. (2010). Global estimates of the prevalence of diabetes for 2010 and 2030. Diabetes research and clinical practice, 87(1), 4-14. [DOI]

Who, J., & Consultation, F. E. (2003). Diet, nutrition and the prevention of chronic diseases. World Health Organ Tech Rep Ser, 916(i-viii).

World Health Organization. (2005). Preventing chronic diseases: a vital investment: WHO global report.

World Health Organization. (2009). Global health risks: mortality and burden of disease attributable to selected major risks. World Health Organization.

World Health Organization. (2009). Women and health: today's evidence tomorrow's agenda. World Health Organization.

World Health Organization. (2010). Global strategy to reduce the harmful use of alcohol.

Yusuf, S., Hawken, S., Ôunpuu, S., Dans, T., Avezum, A., Lanas, F., & Lisheng, L. (2004). Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. The Lancet, 364(9438), 937-952. [DOI]