

Cardiovascular Disease and Health

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Abstract

Introduction: The purpose of writing this article is to emphasize the fact that, in the era of gadgets and high end diagnostic facility to diagnose CAD, the epidemiological modules still have an upper hand in diagnosing CAD. The epidemiological data is easily applicable, adaptable, accessible, affordable and large section of population can be covered at one stroke by stratifying the given population into low risk, intermediate risk and high risk. Accordingly, Clinician can advise regarding future course of action. This article is supported by our observational study done in our institute which echoes the epidemiological data. These highly effective modules are also low cost and highly applicable. These also help the policy makers to focus on preventive measures to curtail growing no of CAD patients so that young life can be saved and loss of man hours and productivity can be saved.

We did one observational study 1 to determine risk factors in patients with premature CAD, the same is presented below and review of literature for the said risk factor is done.

Purpose: Asian Indians - those living in India and also the Diasporas have one of the highest rates of coronary artery disease in the world. Among urban Indians the prevalence of CAD is around 10 - 12%.

Aims: To study the risk factors in patients with premature CAD.

Study Design: A prospective observational study was performed to determine cardiovascular risk factors in patients with premature CAD in India.

Methods: All patients with premature coronary artery disease i.e. males < 55 yrs age and females < 65 yrs age were included in the study. The risks factors were assessed in all these patients.

Results: Total 416 patients were taken in the study, 335 were males (80.53%) and 81 were females (19.47%). The mean age was found to be 48.45 yrs. The youngest patient was 20 years of age. Low fruits and vegetables in the diet (78.85%), smoking (45.91%), high dietary fat intake (45.67%) were the most frequent risks factors. 47.6% of the patients were on predominantly non vegetarian diet. Family history of CAD was found in 22.12% of the patients. Co morbidities, 50.96% were hypertensive, 50% patients had pre-existing diabetes, 25.96% were dyslipidemia and 6.73% hypothyroid on admission. 67.41% patients were in Killip class I, 26.67% in class II, 2.96% in class III and 2.96% in class IV. 68.02% had STEMI, 13.46% had NSTEMI and 9.62% had CSA 8.89% had UA. On coronary angiography 44.47% had SVD, 23.32% DVD 26.20% had TVD and 6.01% had minor CAD. Majority i.e. 53.85% underwent primary PCI, 17.31% were advised elective PCI, 3.13% had recanalized vessel, 2.64% underwent thrombolytic, 10.10% was treated medically and for 12.98% CABG was done.

Conclusion: 1) Smoking is one of the major risk factor for premature CAD. 2) Improper dietary habits are seen in majority of premature CAD patients.

Keywords: Cardiovascular Disease; Hyperlipidemia; Coronary Artery Disease

Abbreviations

CVDS: Cardiovascular Disease; ASCVD: Atherosclerotic Cardiovascular Disease; DM: Diabetes Mellitus; HTN: Hypertension; HLP: Hyperlipidemia; CAD: Coronary Artery Disease; IHD: Ischemic Heart Disease; NCD: Non-Communicable Disease; RHD: Rheumatic Heart Disease; LMICs: Low-Middle Income Countries; PCE: Patient Cohort Equation

Introduction

Cardiovascular diseases are group of disorder affecting heart and its blood vessels. It encompasses coronary artery disease, valvular heart disease, heart failure, arrhythmias, pericardial disease and congenital heart diseases. Due to epidemiological transition several risk factors have emerged afflicting heart. There are modifiable, and non-modifiable. Of late there is emergence of strong risk enhancing factors. The risk stratification and brief therapeutic strategy has been reviewed.

Cardiovascular health refers to the health of the heart and blood vessels. Cardiovascular disease is a group of diseases of the heart and blood vessels, including coronary heart disease, stroke, heart failure, heart arrhythmias and heart valve problems. There are several risk factors that lead to the development of cardiovascular disease, including high blood pressure, high blood cholesterol, tobacco use, and diabetes.

Cardiovascular disease (CVD) is the most common cause of premature death in the world. 20th century has seen trend in declining mortality rate for cardiovascular disease, this is more so in high income countries. But many low and mid income countries (LMICs) have not benefited from this favourable trend. As a result nearly 70% cardiovascular disease death occurring in LMICs and 50% of them are women. 50% of non-communicable disease (NCD) death in the world each year is due to cardiovascular disease.

In every region leading cause of death is cardiovascular disease. Only recently global action plan by WHO has come in vogue to combat this performed health burden. Members states have now agree to meet to meet 9 NCD health and policy targets. This included reduction of NCD mortality by 25% [2].

Global burden in CVD mortality [3]

The cardiovascular diseases the leading cause of CVD death accounting for more than 8 million followed by CVA. RHD was also significant contributor for global burden and leading cause of highly preventable death. Death rate as a result of CVD was 376/ten thousand globally fell to 293/1 lakh by 2013- a 22% reduction in mortality. However, there are regional variation with higher CVD rate in central Asia and Eastern Europe and lowest rate in high income countries. The age standardised death rate were more in males then females. Despite all these the total number of death increased from 12.2 million to 17.3 million (41% increased from 1992 to 2013) [4]. This burden is more in LMICs, therefore the burden of CVD death shifted and worst affected are LMICs where there are complex interaction between environmental exposure, demographic changes, cardio metabolic risk and equally important access to quality health care [5].

Impact of population growth and aging

Global age specific CVD death rate is declining in one hand and because of demographic change it is increasing on other hand. As population ages and proportion older person aged 60 and above increase overtime; it will be doubled by 2050 and tripled by 2100, with more than 2/3rd older adults residing in LMICs. There is geographical variation in cardiovascular disease South Asia has worrisome pattern with dramatic raise in CVD and death without a significant declined in death caused by epidemical changes [6].

IHD

Is the leading cause of death worldwide it includes all types of coronary syndrome, chronic IHD, medical surgical, percutaneous revascularisation procedures. Mortality due to IHD is increasing in central Asia, south East Asia, East Asia, the pathetic scenario. The larger population in this region are relatively young IHDs leading to significant morbidity and economic burden, loss of job and stress on the family [7].

Various factors are responsible in brief are

Behavioural factors

Tobacco

The adverse relationship between cigarette smoking and CVD was seriously recognised in 1964 after publication of surgeon generals' reports. This report concluded that cigarette smoking is strongly associated with MI and CAD, CVD death. Globally there is increasing smoking due to population growth. Worldwide prevalence of smoking among adults 40% eastern Euro, 45% in china, 36% Japan, 23% India. There is difference by age Prevalence of smoking was seen in males 44 - 49 years (41%) and in females 50 - 54 years (8.7%).

Most avoidable important cause of CVD and death.80% current smokers leaving LMICs. Tobacco causes nearly 9% all death [8]. IF current rate of smoking, continues then the global burden of disease attributable to tobacco will reach 10 million by 2030 [9] with majority in LMICs. In LMICs smoking rates are in the rate of 50 - 61% [10]. Surprisingly it's reported that smoking in girls is increasing as much as in boys in these countries [11]. The unique features are in LMICs is easy access to smoking during early stage of the epidemiological transition, because of availability of relatively in expensive tobacco products. The impact is rapid raising CVDS rise. For example, in China tobacco consumption of 13% of death [12].

Diet

Due to the epidemiological transition the per-capita income raises accordingly the consumption of fatty food, calories also increases [13]. The calorie consumption has grown up by 22% in the last 5 years [13]. The key element is increased consumption of saturated fat and hydrogenated vegetable fat which contained atherogenic transfatty acids. At the cost of substantial reduction of consumption of plant based food and increasing carbohydrate consumption. From 1991 to 2000% calorie derived saturated fat has decreased from 11 - 12%, this is healthy trend this was accompanied by increased consumption simple carbohydrate. Any country in developing transition will see increase in this diet trend even in LMICs [14] which is a contributing factor in CVDs.

Physical inactivity

As there is industrialisation and urbanisation, mechanisation for economic growth there is equally decrease in physical activity. As the population switched from physically demanding, agriculture based work to largely sedentary service, office based work is one of the main reason for decreased physical activity. Physical inactivity is one of the major risks of CHD [15]. Others are Smoking, Diabetes Mellitus, Hypertension, Hyperlipidemia, but percentage wise the risk level is high in sedentary. One need to take example from China [16] were 90% population have adopted exercise as an integral part of education and exercise have become mandatory between 6 - 17 years of age. Many either they walk or ride by-cycle to the work station. In our country daily we see students in this age group where physical activities dismal.

Metabolic factors

The association of plasma cholesterol level and CVD is indisputable. Low HDL, high triglycerides was also associated with CVD.

Interheart-study found that, across the globe abnormal lipid level and smoking are the most important risk factor for heart attack [17]. It is estimated that high cholesterol level accounts were 56% IHD in worldwide and 18% stroke: put together it accounts war 4.4 million death annually. The epidemiological transition a country goes through the mean plasma cholesterol level increases because of social and individual factors (occurs due to urbanisation). There is different between urban rural population this shift a largely given by increased consumption of dietary fat and decreased physical activity, e.g. in rural Nigeria early transition based (the mean cholesterol level 120 mg/dl) in contrast to USA which is 5th phase epidemiological transition mean level 203 mg/dl [18]. 50% American have cholesterol more than 200 mg/dl, 17% have more than 240 mg/dl [19], data from WHO MONICA project demonstrated considerable variation in prevalence of high cholesterol among 19 participating countries as well as within countries. On an average prevalence of hyper lipidemia (more than 250 mg/dl) was 27% among men and 25% among women. At present in high income countries mean cholesterol level is falling but in

LMCS there are wide variations. In Asia cholesterol level rose faster in urban than in rural areas [20]. Once as low as one and 15 mg/dl rose to 190 mg/dl. In nutshell the rate of raise of cholesterol level is faster because lack of awareness detection and treatment.

Obesity

There is a clear association between on obesity and CHD.

Most of it mediated via DM, HTN, and HLP. Obesity accounts of approximately 58% DM, 21% IHD, 14.2% of certain cancers and more than 10% total death across the world [21].

WHO MONICA study reveal that in female population 52 - 75% of adults between 35 - 64 years are over weight [22]. There is already a trend in raising obesity rate even in LMICs. Excess weight early in life leads to adult obesity which in turns leads to increase in DM, HTN, CVDs. BMI steadily increasing among children in LMICs because of decreased physical activity and consumption of fast food [23].

Hypertension

Clearly a risk factor for CAD and stroke. Increasing in BP is an early hall mark epidemiological transition. Emigration from rural to urban setting results in raise in BP level due to various factors. Among urban dwelling E.g. India, the prevalence of HTN in men and women are 25.5 and 29% respectively whereas it is 14 - 10.8% in rural areas [24]. The relative mortality were given level of BP is same all over the world [25]. In addition, overall impact varies depending on treated or untreated HTN. Approximately 62% strokes and 49% IHD are attributed to suboptimal BP control and though account of more than 7 death annually. In high income countries HTN remain in major cause of CBD, morbidity and mortality, despite high rate of detection or treatment. Untreated HTN is a concern because of the increasing rate of strokes-hemorrhagic. Several large cohort study with more than 3 million person years of follow up demonstrated continued long lineal, relationship between increasing systolic BP with risk of stroke, IHD, CVD death [26].

Diabetes mellitus

One of the strong risk factor for IHD, CVA, PVD. There is increased prevalence of DM, as a consequence or in addition to decreased physical activity and increase in BMI. In 2003 in 5% world population has DM, living in high income countries. By 2025 this number as per prediction may rise to 333 million (72% increase) [27]. India is DM capital of world. It has 31.5% million people in DM. This No. expected to reach 57.2 million by 2025 and significant role in causation of IHD. DM also associated with other risk factors increased triglycerides levels, low HDL, central obesity, HTN. The absolute risk of DM is high in women than in Men.

Cholesterol

Framing harm study [28], British regional heart study [29] and study of 361662 meant by Martin A., *et al.* [30] all demonstrated an increased risk of CAD within the population proportional to the serum cholesterol levels with men in their highest quintile carry a 3 hold death risk then those below the lowest quintile.

Lipoprotein A

Study has revealed association plasma lipoprotein a concentration and ASCVD [31,32], lipoprotein A have not been established as a strong independent risk factor for CAD in whites [33], Chinese [34] and Japanese population [32]. Lipoprotein A level of more than 30 mg is generally considered the threshold at which the high risk of premature CAD increases rapidly. The pathophysiological importance of excess lipoprotein A in the morbidity and mortality due to CAD among south Indian has not been established so far. Level protein A has risen among south Asian and suggest a genetic predisposition to CAD. What is certain though is that south Asian in particular are prone to the development insulin resistance syndrome characterised by increased waist Hip, ratio increased prevalence of IGT and frank DM. Hyperinsulinemia and deranged metabolic parameters in the form of hypertriglyceridemia and low HDL. This constellation of finding

result in manifestations symptomatic CAD at younger age and with more severe and extensive CAD in smaller vessel as demonstrated by coronary angiogram [35].

Having dealt with epidemiological factor responsible for CAD and risk factor which emerged during transition it is time to focus on assesses the risk and that categorising to execute prevention strategy for ASCVD. Most critical step in the current approach to primary prevention of ASCVD is risk assessment.

Knowledge of 10 year risk for ASCVD identifies patient in higher risk group who are likely to have greater net benefit and lower no. needed to treat with for both statins, and antihypertensive.

The 2018 cholesterol clinical practice guidelines [36], recommend the use of quantitative 10 year risk assessment based on measurement traditional ASCVD risk factors and with use of a validated risk prediction to as the first step in considering treatment option for primary prevention. In the present guidelines patient with estimated 10 years ASCVD risk of 5-less than 7.5% are considered to be: Borderline risk and may be considered for statin therapy under some circumstances; those with intermediate- 1-10 yrs risk 7.5 to less than 20% should be considered for institutions of moderate to high intensity statin therapy, on those with high; 10 yrs risk of more than 20% should be considered for high intensity statin therapy.

Of all the available risk prediction to the most validated one is patient co-heart equation's (PCE) [36,37].

Guideline recommend: PCE for most primary prevention. (Except those with familiar hypercholesterolemia or LDL of more than 190 mg/dl. Other risk profiles are Framingham general CVD risk profile [38], very closed to PCE. Reynolds risk score [39,40] appears better but includes coronary revascularisation as an end point. This limit the implementation with regard to primary prevention.

Special population

This risk prediction module should not be applied with patient with established ASCVD, who requires secondary prevention or those with conformed familial hypercholesterolemia or borderline LDL more 190 mg/dl. These groups require intensive stain therapy. On the same note most patient with established DM should be considered for stain therapy and for antihypertensive drug therapy (BP is high) regardless of predicate 10 yr risk. These risks score apply to individual 40 - 75% yrs age. Limited data using this module in less than 40 yrs of age. It is reasonable to consider 30 yrs life time risk evaluation [41]. For more than 75 yrs existing risk score performed poorly because of weaker association of tradition risk factors with events at these older ages and competing risk of non-cardiovascular mortality. South Asian population appears to be somewhat higher risk [42]. Long term or life time risk assessment [43] proves further prospect on the long consequence of single elevated clinical risk factor and the aggregate burden of risk factors level over a longer time horizon used full in less 50 yrs even with 10 yrs low risk for instituting drug therapy for primary prevention ASCVD the clinician and patient should begin by calculating the 10 yrs and lifetime ASCVD risk estimation [44].

2018 cholesterol clinical guideline [36] identified risk enhancing factors or co morbidities than should be considered to affect 10 yrs risk estimation for individual patient.

Reclassifications of risk using calcium score

Best additive test helps to classifying ACVD risk for decision making regarding statin therapy (for details see MESA) [5]. Very useful tool in reclassifying in low and intermediate risk.

Way forward

Research: Effect of Epidemiological transition on LDL Receptors.

Preventive measures

Because of multifactorial nature of CVD and social, economic and cultural heterogeneity, no single solution is applicable to all. Broadly speaking the following 3 complimentary strategies can reduce morbidity and mortality from CVD.

Population based, public health, measures can lower overall burden of CVD risk factors:

1. These included public awareness, surveillance strategies, educational campaigning, institution of low cost, effective, population based preventive intervention, aggressive campaigning against smoking.
2. Identify high risk group who would benefit from specific low cost intervention such as treatment of HTN, HLP.
3. Recourse allocation for acute on chronic CVDs and higher cost of treatment secondary prevention strategies.

Conclusion

Cardiovascular disease is the leading cause of death globally. Multipronged strategy is the need of the hour to tackle this huge burden, especially Coronary artery disease. Smaller changes made by larger number of people will have more impact than larger changes made by an individual.

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