Surveillance of mortality and cardiovascular disease (CVD) related morbidity in Industrial settings

Background

With the epidemiologic transition the CVD burden continues to rise in developing countries including India. The projected rise in disease burden due to CVD is expected to make it the prime contributor of total mortality and morbidity. Almost 2.6 million Indians are predicted to die due to coronary heart disease (CHD), which constitutes 54.1% of all CVD deaths in India by 2020. Additionally, CHD in Indians has been shown to occur prematurely, that is, at least a decade or two earlier than their counterparts in developed countries. Demographic and health transitions, gene-environmental interactions and early life influences of fetal malnutrition are the likely causes of increased CVD burden in India.

Intervention and prevention programs are being sought to curb this rise in chronic disease burden and save as many people as possible. In India, all within an epidemiological mosaic where infectious and communicable diseases coexist, with limited capacity to implement programmes on prevention and control of chronic diseases as a public good it is important to think about alternative strategies to curb this rising epidemic. Technical, management and political approaches involving new partnerships, new ways to involve different stakeholders in the process, new methods and tools, ways to overcome resource restrictions and to improve effectiveness of monitoring techniques, have to be achieved.

The workplace is an important location for successful prevention strategies because employees today spend a growing amount of time at work and employers can influence behavior by providing a supportive environment and leveraging existing infrastructure to offer low-cost but effective interventions. Understanding this opportunity we have initiated a demonstration project in 7 industrial sites in India to appraise the role of health promotion and life style intervention programme on CVD risk reduction. The ultimate goal of risk factor prevention, detection, and control is to prevent acute events. Consequently, surveillance of cardiac arrests, heart attacks, and strokes is needed to fully assess the impact of risk factor

prevention, detection, and control efforts; furthermore, such surveillance would also provide a population in which to assess the impact of efforts to rapidly identify and treat these events.

Optimal surveillance of acute cardiovascular events

Comprehensive CVD public health programs should necessarily include monitoring of CVD related mortality and morbidity through established public health surveillance system. Such a system is essential to provide the data required for effective public policy, allocation of preventive resources, developing capacity, allocation of medical services, allocation of research resources and evaluation of control/prevention strategies. Optimal surveillance of acute events requires an understanding of the distinction between incident and recurrent events. Incident events, or first occurrences of heart disease or stroke in persons without known prior heart disease or stroke, differ in important ways from recurrent events, or later attacks in persons with known prior disease.

The success of acute treatment influences the size of the population at risk for recurrent events, and subsequent medical care, in addition to other factors, influences that risk. Surveillance systems that enable discrimination between incident and recurrent events provide a much clearer indication of the changing natural history of heart disease and stroke occurrence in the community. Surveillance of incident events is important for evaluating public health measures aimed at maintaining health and function in currently asymptomatic persons. Surveillance of recurrent events also enables the evaluation of efforts aimed at preventing recurrent events. Surveillance systems that are limited to the estimation of attack rates, in which incident and recurrent events are not distinguishable, provide data relevant to the early identification and treatment of acute events, including the quality and outcomes of acute care, but do not provide sufficient data to evaluate the specific impact of separate efforts targeting prevention of incident and recurrent acute events.

Incident heart disease events can be especially difficult to monitor, however, because cardiac arrest (also known as sudden cardiac death) is often the first manifestation of ischemic heart disease. Surveillance of sudden cardiac death is complicated by the poor level of agreement between sudden cardiac death rates based on vital statistics data and based on adjudicated data. Despite this limitation, roughly half of sudden cardiac deaths are believed to occur in persons without known heart disease, and sudden deaths in persons without heart disease may comprise more than one fifth of all coronary heart disease deaths. Sudden deaths and out-of-hospital deaths, whether due to heart disease or stroke, are often missed by hospital-based surveillance systems. Identification, validation, and classification of out-of-hospital deaths require additional surveillance efforts, including access to death certificate data and contact with next of kin, physicians, coroners, and other informants. In addition, classification of sudden death as an indicator of disease incidence requires exclusion of preexisting, or prevalent, disease, which can be difficult without detailed diagnostic evaluation and/or medical history; nevertheless, surveillance of cardiac death as the initial manifestation of heart disease would provide important insight into the effectiveness of prevention efforts targeting risk factor prevention, detection, and control.

Assessment of incidence is crucial for assessing the population burden of disease and the effectiveness of preventive efforts. Although incidence is typically expressed as a rate per specific population size and time period (such as cases/100 000 population per year), total or absolute numbers of cases are also valuable in assessing total disease burden. Population-based rates, which require reliable data on population size (denominator), are most useful for comparing risk of disease between subgroups, such as those defined by sex, ethnicity, and presence or absence of risk factors. Absolute numbers of cases are useful for evaluating disease burden and planning for distribution and use of healthcare resources.

Surveillance of mortality and CVD related morbidity in industrial settings

The methodology and the results of CVD related morbidity and mortality surveillance in the industrial settings (a surveillance system established to monitor the trends in CVD risk factors, and to assess the impact of health promotion and lifestyle intervention programme on cardiovascular disease health profile) is presented below. At each study site, the surveillance team was headed by a Principal Investigator (PI) from the nearby medical college and an Industrial Medical Officer (IMO) who represented the industry. They were assisted by a research team comprising of medical and non medical staff. They acted in concert with the medical officers and other health personnel in each industry to conduct the field study and establish the regional database.

CVD mortality and morbidity registries were initiated at all participating industries successfully from May, 2003 onwards. It requires registration of all mortalities and hospitalization events in the target community (employees and their family members). A registration log was maintained by the project staff (a medical doctor and a social worker) and this was updated monthly after gathering information from the welfare department. The death of an employee is usually informed to the welfare department on the same day by the relatives or friends of the diseased. The employees were asked to report all deaths (in the age group of 20 or more than 20 years) in their family and all hospitalization events to the welfare department. The project staff then contact the diseased person, their family members, friends, and the treated physician/doctor/hospital. A simple proformae was used to gather all related information in a uniform manner. This was aimed at identifying deaths due to CVD and non-fatal CVD events with a focus on hospitalized events, myocardial infraction and stroke. Proforma and protocol were developed and discussed in a national level workshop and subsequently piloted at each centre. Feed-back from site investigators and the site industrial medical officers were used to further modify the proforma. The project staff were trained to administer these proformea by the national coordinating centre (NCC) team at IC Health. They were also told to collect all supporting documents and attach it along with proformae. The principal investigator in each

centre was advised to mail the completed morbidity and mortality proformae monthly to the NCC after verifying the contents.

The accuracy and completeness of data entered in the proformea was verified and the supporting documents were checked at the NCC. Additional information were sought to categorise the events into two categories (a) CVD related and (b) non-CVD related. All events under the ICD 10 code 101-199 were classified as cardiovascular and other as non cardiovascular deaths. A simple data entry application was developed and used for data entry. The data entry was completed by designated data entry staff at the NCC. The preliminary data analysis was also completed at NCC and the results are presented below.

A total of 425 deaths were reported in the period of May 2003 to April 30, 2007 April 30. The overall mortality rate was 6.6/1000 person years of follow up. More than half of the deaths (57.3%) were in the low education group and the mortality rate in this group was 13.5/1000 person years of follow up. The cause death was ascertained by examining different source documents including death certificate, medical records, hospital discharge summaries and discussion with the treated doctor. However, we could not classify the cause of death in 13.0 % of the total deaths. Cardiovascular diseases accounted for 40.1% (n=170) of the total deaths. Similarly, 46.9% of the total deaths were attributable to non-cardiovascular diseases. The classifications of cause of deaths were given in table 1. Mean age at the time of death was 55.1 years (SD=16.0 years). Majority (81.1%) of CVD deaths were occurred below the age of 70 years.

Table 1: Classification of cause of death

Cause of death	No. of Cases	Percentage %
CVD	170	40.1
Non-CVD	199	46.9
Non Classifiable	56	13.0
Total	425	100.0

A total of 489 CVD related morbidities (Hospital admissions) were reported in the period of May 2003 to April 30, 2004. The mean age at the time of hospital admission was 54.2 years (SD=12.8 years). We have got complete medical records in 75% of the cases. After reviewing the medical records we assigned the final diagnosis and we found that the two frequent reasons for hospital admission were acute coronary syndromes (44.3%) and stroke (26.3%). The remaining morbidities were attributable to other CVDs. These include angiogram evaluation for CHD, CHF, CABG, and related to valvular diseases etc.