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Original Article

Prevalence of coronary artery disease and coronary risk factors in Kerala, South India: A population survey – Design and methods

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ABSTRACT

Background: There is paucity of reliable contemporary data on prevalence of coronary artery disease (CAD) and risk factors in Indians. Only a few studies on prevalence of CAD have been conducted in Kerala, a Southern Indian state. The main objective of the Cardiological Society of India Kerala Chapter Coronary Artery Disease and Its Risk Factors Prevalence Study (CSI Kerala CRP Study) was to determine the prevalence of CAD and risk factors of CAD in men and women aged 20–79 years in urban and rural settings of three geographical areas of Kerala.

Methods: The design of the study was cross-sectional population survey. We estimated the sample size based on an anticipated prevalence of 7.4% of CAD for rural and 11% for urban Kerala. The derived sample sizes for rural and urban areas were 3000 and 2400, respectively. The urban areas for sampling constituted one ward each from three municipal corporations at different parts of the state. The rural sample was drawn from two panchayats each in the same districts as the urban sample. One adult from each household in the age group of 20–59 years was selected using Kish method. All subjects between 60 and 79 years were included from each household. A detailed questionnaire was administered to assess the risk factors, history of CAD, family history, educational status, socioeconomic status, dietary habits, physical activity and treatment for CAD; anthropometric measurements, blood pressure, electrocardiogram and fasting blood levels of glucose and lipids were recorded.

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1. Background

Coronary artery disease (CAD) affects millions of people the world over. Studies from the United States of America and elsewhere have established CAD as a leading cause of morbidity and death. The prevalence of CAD among adults in the USA in 2005 was 7.3%.[1] It is estimated that migrant Asians have the highest prevalence of CAD in the world.[2–4] However, there is paucity of reliable contemporary data on prevalence of CAD and risk factors in native Indians.

Various studies from India have shown high prevalence of the disease, approaching approximately 11% in the urban population and 7% in the rural population across India.[5–15] In a systematic review of 27 prevalence studies from India, Ahamed et al noted that many of the studies did not meet the basic requirements of epidemiologic research and most studies were from Delhi or surrounding areas.[16] An urban survey by Mohan et al from Chennai, South India reported a prevalence rate of 11% in 2001.[17] Only a few studies on prevalence of CAD have been conducted in Kerala, a Southern Indian state. A study by Kutty et al in 1993 in a Southern rural area of Kerala reported a CAD prevalence rate of 7.4%.[18] There have been no major studies on prevalence of CAD in Kerala since then; nor are there any prevalence studies from rest of the state. It cannot be assumed that figures from the Southernmost region of Kerala are applicable to rest of the state.

The huge burden of CAD in India is the consequence of a large population as well as high prevalence rate of CAD risk factors. A case-control study of risk factors for CAD (the INTERHEART Study) including a considerable number of participants from India showed the importance of conventional risk factors in the causation of CAD.[19] There has been an explosion in the prevalence of traditional risk factors of CAD in India, largely driven by the rapid increase in the proportion of urban inhabitants. Urbanization has resulted in development of dysglycemia, hypertension, dyslipidemia and metabolic syndrome, providing necessary milieu for rising incidence of CAD. The recently published study in urban, rural and slum settings in Thiruvananthapuram showed a high prevalence of CAD risk factors.[20]

The main objective of the Cardiological Society of India Kerala Chapter Coronary Artery Disease and Its Risk Factors Prevalence Study (CSI Kerala CRP Study) was to determine the prevalence of CAD and risk factors of CAD in men and women aged 20–79 years in urban and rural settings of three geographical areas of Kerala.

2. Design and methods

The design of the study was cross-sectional population survey.

2.1. Determination of sample size

We estimated the sample size based on an anticipated prevalence of 7.4% of CAD for rural Kerala based on the data by Kutty et al[18] and 11% for urban Kerala based on the study by Mohan et al in Chennai.[17] The lowest acceptable prevalence was considered as 6.08% (95% confidence interval 6.08–8.78%) for rural Kerala and 9.2% (95% confidence interval 9.2–12.8%) for urban Kerala. Since the sample selection was closer to cluster sampling, a design effect of 2 was also considered for arriving at the final sample size. The level of confidence was taken as 1.96 which was the probability value associated with 95% confidence interval. The level of precision used in the rural area was 1.35% and that for urban area was 1.8%.

The total sample size (n) was estimated using the formula, $n = Z^2 P (1-P)/e^2$ where Z was the level of confidence, P was the anticipated prevalence and e was the level of precision. The derived sample sizes for rural and urban areas were 3000 and 2400 respectively.

2.2. Sample selection procedure

Subjects of the study were adults between the ages 20–79 years who were permanent residents of the areas of sampling. Electoral rolls updated in 2010 for the respective electoral wards were taken as the basic documents for selection of participants. Errors in the electoral rolls were corrected by volunteers after visiting each household.

2.3. Urban area

Kerala, the southernmost state of India (Area 38360 sq. km) has 14 districts with a total population of 33.39 million as per 2011 census. The urban administrative units are municipal corporations. We chose one municipal corporation each from the southern, central and northern districts for the survey to ensure equitable geographic distribution (Fig. 1).

Each municipal corporation is divided into electoral wards. The southern Thiruvananthapuram municipal corporation has 100 wards, central Thrissur municipal corporation 55 wards and northern Kozhikode municipal corporation 75 wards. One of the wards from each of the corporations was randomly selected. Thus, three randomly selected wards from the three major cities of Kerala constituted the urban area for this study. The areas of sampling and the population statistics is given in Table 1.

We divided each of the selected wards into three to six geographical units and randomly selected one of these units. From the selected unit all the households were included in the survey. Using the updated voters' list, each household was numbered serially (Household Index Number – HIN). A list of all the eligible participants was constructed, men and women separate, from each household with separate columns for those at or above 60 years and for those between 20 and 59 years of age. One adult from each household in the age group of 20–59 years was selected using Kish method (WHO STEPS Manual[21]) to ensure representation of the age-sex distribution of the population. Briefly the Kish method was as follows: a list of participants between 20 and 59 years was constructed in the descending order of age, first for males and then for females in each household. Random selection of one subject from each household was done using Kish table. All subjects between 60 and 79 years were included in the sample to ensure sufficient number of subjects in the older age group in