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Original Article

Prevalence of coronary heart disease in rural and urban Vellore: A repeat cross-sectional survey☆

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ABSTRACT

Background: With the increase of cardiovascular risk factors in India, the prevalence of coronary heart disease (CHD) is also expected to rise. A cross-sectional study in 2010–2012 assessed the prevalence and risk factors for CHD in urban and rural Vellore, Tamil Nadu. The secondary objectives were to compare the current prevalence with the prevalence of CHD in the same areas in 1991–1994.

Methods: A cross-sectional survey was carried out among adults aged 30–64 years to determine the prevalence of CHD (previously diagnosed disease, symptoms detected using Rose angina questionnaire, or ischemic changes on electrocardiography). The study used the WHO STEPS method in addition to the Rose angina questionnaire and resting electrocardiography and was conducted in nine clusters of a rural block in Vellore district and 48 wards of Vellore town. The results were compared with a similar study in the same area in 1991–1994.

Results: The prevalence of CHD was 3.4% (95% CI: 1.6–5.2%) among rural men, 7.4% (95% CI: 4.7–10.1%) among rural women, 7.3% (95% CI: 5.7–8.9%) among urban men, and 13.4% (95% CI: 11.2–15.6%) among urban women in 2010–2012. The age-adjusted prevalence in rural women tripled and in urban women doubled, with only a slight increase among males, between 1991–1994 and 2010–2012.

Conclusions: The large increase in prevalence of CHD, among both pre- and post-menopausal females, suggests the need for further confirmatory studies and interventions for prevention in both rural and urban areas.

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1. Introduction

Risk factors for coronary heart disease (CHD), such as diabetes, hypertension, dyslipidemia, and obesity, are on the rise in developing countries such as India.[1–4] Non-communicable diseases are now the major cause of death in India, with cardiovascular diseases being the dominant cause.[5] With CHD in south Asia and the Middle East affecting a younger age group than elsewhere,[6] it is necessary to study the trend of

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prevalence of this condition to promote measures for prevention and decreasing mortality. Recent studies of prevalence of CHD in India conducted using the Rose questionnaire and electrocardiography in Chennai, Rajasthan, Kerala, Uttar Pradesh, Srinagar, and Delhi among others show increasing prevalence of CHD countrywide,[7–13] with mortality data showing higher mortality due to CHD in South India.[14]

This repeat cross-sectional study documents the changes in prevalence of CHD in a rural block and a town in Tamil Nadu, south India, from 1994 to 2012 and also estimates the association of CHD with its risk factors.

2. Methods

A cross-sectional study was conducted in 1991–1994 in 20 urban clusters of Vellore town and 23 clusters of a rural block in Vellore district, selected by probability proportional to size, to assess the prevalence of CHD and its risk factors among all adults aged 30–60 years in the selected clusters. A repeat survey was done using the WHO STEPS method[15] in 48 out of 60 urban wards (selected consecutively according to ward numbers) and nine randomly selected clusters of the 23 rural clusters surveyed earlier, between June 2010 and December 2012. While all individuals in the eligible age group were invited for the survey in the rural clusters, one street was randomly selected among the 48 urban clusters.[16]

Trained field workers and social workers collected history for socio-demographic and behavioral risk factors through house-to-house interviews. Medical history was obtained by physicians or trained research nurses along with physical and biochemical measurements obtained at clinics set up in the study villages/wards. Further details of the methodology used in the surveys including quality control of biochemical tests have been described in earlier publications.[16,17]

Risk factors included diabetes (fasting venous blood sugar of 126 mg% or more or on medication), blood pressure ≥140/90 mmHg (average of two readings, obtained using an automated apparatus OMRON) or on medication, total cholesterol ≥190 mg% or on medication, triglycerides ≥ 150 mg%, low HDL (<40 mg% in males and <50 mg% in females), and physical activity (low, moderate, and vigorous) defined according to the guidelines for analysis of WHO STEPS surveys.[15] Abdominal obesity was defined as waist circumference ≥80 cm in females and ≥90 cm in males,[18] overweight as BMI 25–29 kg/m^2, and obesity as ≥30 kg/m^2. Fruit and vegetable intake was measured as number of servings per day (1 serving = 80 g).[15] Clustering of risk factors was defined as combination of current daily smoking, less than five daily fruits and vegetable servings, low physical activity, overweight (BMI ≥ 25 kg/m^2), and blood pressure ≥140/90 mmHg or on medication, according to the STEPS guidelines.[15]

CHD was defined as previously diagnosed CHD (verified by medical records where available), symptoms detected by the Rose angina questionnaire,[19] or electrocardiographic (ECG) changes suggestive of ischemia. The ECGs were taken using the BPL Cardiart 6208 View electrocardiograph, which also provided automated Minnesota codes, reassessed by a cardiologist unaware of the patient's clinical history, using the American Heart Association/American College of Cardiology Foundation/Heart Rhythm Society recommended criteria for abnormalities in Q, ST, and T waves.[20,21] In the earlier survey, ECG changes suggestive of ischemia were also assessed by trained cardiologists, using the "Minnesota Code 1982" criteria for ischemia using a standard 12-lead electrocardiogram.[22]

2.1. *Statistical methods*

As the first survey was done among adults aged 30–60 years and the second among those aged 30–64 years, the comparison of results is restricted to the population aged 30–60 years in both surveys. Age standardization was done using the Census of India 2001 data to enable comparison of rates. For the repeat survey (2010–2012), 95% confidence intervals were calculated using adjustment for cluster design.[23] Chi-square tests were used to compare proportions and adjusted odds ratios were calculated for risk factors for CHD using binary logistic regression.

3. Results

In 2010–2012, out of 3121 persons aged 30–64 years in the urban area and 4537 in the rural area, 2397 (77%) and 3799 (83%) were interviewed respectively, as part of the study.

The interviewed population was similar to the general population of the district in literacy, religion, and occupational pattern.

The prevalence of CHD among rural males was 3.4% (95% CI: 1.6–5.2%) and 7.4% (95% CI: 4.7–10.1%) among rural females (Table 1). The prevalence among urban males was 7.3% (95% CI: 5.7–8.9%) and 13.4% (95% CI: 11.2–15.6%) among urban females.

While the prevalence of previously diagnosed CHD was higher among men as compared to women, women had higher rates of ECG evidence of ischemia as well as symptoms of angina (Table 1). As compared to rural participants, rates of previously diagnosed CHD, ECG changes, and symptoms were two to three times higher among urban participants. Majority (95%) of the participants who were diagnosed to have ischemic changes on ECG were asymptomatic (117/123).

The rates of CHD among pre- and post-menopausal women (amenorrhoea for 12 months due to natural menopause) are shown in Table 2. Both pre- and post-menopausal women had higher rates of abnormal ECGs as well as symptoms of angina as compared to men, although previously known disease was lowest in pre-menopausal women.

In the earlier survey (1991–1994), 4693 rural and 2649 urban participants were examined, which constituted 71% and 75% of the eligible population aged 30–60 years in the study area. Comparison of the age-adjusted prevalence rates of CHD between the two surveys showed a significant increase in the rates of CHD among females aged 30–60 years in both the rural and urban areas, with only a small rise in prevalence rates among urban males (Table 3). Age-specific rates showed that CHD among women below 50 years increased between the two surveys whereas there was no change in age-specific prevalence rates among males (Table 4).

Female sex, urban residence, lower education, past history of smoking, low daily intake of fruits and vegetables, family history of premature heart disease, and diabetes mellitus were

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