Original Research

Economic burden and cost determinants of coronary heart disease in rural southwest China: a multilevel analysis

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ABSTRACT

Objectives: To estimate the economic burden of coronary heart disease (CHD) in a given year (2010), including direct and indirect costs, and examine the impact of contextual and individual socio-economic (SES) predictors on the costs of CHD among adults in rural southwest China.

Study design: Cross-sectional community survey.

Methods: In total, 4595 adults (aged ≥18 years) participated in this study. A prevalence-based cost-of-illness approach was used to estimate the economic burden of CHD. Information on demographic characteristics of the study population and the economic consequences of CHD was obtained using a standard questionnaire. Multilevel linear regression was used to model the variation in costs of CHD.

Results: In the study population, the overall prevalence of CHD was 2.9% (3.5% for males, 2.3% for females). The total cost of CHD was estimated to be US$17 million. Inpatient hospitalizations represented the main component of direct costs of CHD, and direct costs accounted for the greatest proportion of the economic burden of CHD. Males were more likely to have a higher economic burden of CHD than females. A positive association was found between the individual's level of education and the economic burden of CHD. Residence in a higher-income community was associated with higher costs related to CHD.

Conclusions: This study found that both contextual and individual SES were closely associated with the costs of CHD. Future strategies for CHD interventions and improved access to affordable medications to treat and control CHD should focus on less-educated individuals and communities with lower SES.

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Introduction

Cardiovascular disease (CVD) is the main contributor to the global burden of disease, accounting for half of all deaths due to non-communicable diseases worldwide.[1] In China, CVD is the leading cause of mortality, and both morbidity and mortality rates are increasing.[2] Coronary heart disease (CHD) is the second leading cause of cardiovascular death in the Chinese population, with more than 700,000 deaths attributed to CHD recorded in China in 2002.[3] In recent decades, the incidence and mortality rates for CHD have increased in China, particularly in rural areas,[4,5] and the absolute numbers of CHD events and deaths are predicted to increase dramatically between 2010 and 2029.[6]

Evidence from previous studies indicates that CHD places an enormous economic burden on societies in terms of both direct health care costs (related to treatment) and indirect costs (related to loss of productivity).[7,8] Furthermore, data from existing studies suggest that individual socio-economic status (SES) is closely related to health care costs.[9] Age and household income play an important role in the magnitude of the direct cost of illness, and CHD patients with lower SES are significantly less likely to use treatments that will reduce the risk of death or rehospitalization.[10,11] However, little is known about the association between contextual SES and costs of CHD. To date, relatively little relevant research has been undertaken on the economic consequences of CHD in China, and the associations between individual and contextual SES and costs of CHD are poorly understood.

The aim of this study was to use a prevalence-based cost-of-illness methodology to estimate the economic burden of CHD from a societal perspective, including direct medical costs, direct non-medical costs and loss of productivity (indirect costs), and to apply multilevel regression analysis to examine the correlation between both individual and contextual SES and costs of CHD among the rural adult population of southwest China in a given year (2010).

Methods

Study area and population

A community-based cross-sectional survey was conducted in Guan Du District in the southwest province of Yunnan, one of the poorest provinces in China. In the context of Yunnan Province, Guan Du is a comparatively economically advantaged rural area, and has a population of 462,246 (229,444 males and 232,802 females), nine townships and a total area of 552.21 km.[12] The main source of income in Guan Du is sales of grain, vegetables and flowers.

To ensure the representativeness of the study sample, the groups selected for the study covered all nine townships in Guan Du. Three villages were chosen by the probability-proportional-to-size method within each of the nine townships. In each selected village, simple random sampling from a list of individuals aged ≥18 years, obtained from the relevant village government officials, was applied to select the sample participants.

Data collection and measurement

Ten fifth-year medical students and five Master's degree students from Kunming Medical University were selected and formally trained as interviewers for data collection. All participants who gave their informed consent were interviewed face-to-face by one of the trained interviewers using a pretested structured questionnaire. For subjects who reported a previous diagnosis and/or treatment of CHD by a medical doctor, information on annual inpatient hospitalization expenditures and outpatient expenditures was obtained from the medical records of the relevant health care institution. Information on demographic characteristics, treatment of CHD, self-medication costs (including over-the-counter drugs and prescription drugs acquired through a pharmacy), costs of transportation and accommodation during hospital visits, and work absence due to CHD was collected by patient self-report.

Cost calculation

In this study, the total cost of CHD included both direct and indirect costs.

Calculation of direct costs
Direct costs included direct medical costs and direct non-medical costs. Direct medical costs were those health care expenditures used for treating CHD, comprising inpatient hospitalizations, outpatient visits and self-medication. Direct non-medical costs included costs of transportation and accommodation for the patient with CHD and family members to visit healthcare providers, as well as the costs of hiring caregivers.

The costs associated with outpatient/inpatient visits were estimated by multiplying the number of outpatient visits/inpatient hospital admissions related to CHD by the outpatient/inpatient unit costs per year. The patient's self-estimate was recorded for self-medication costs and direct non-medical costs.

Calculation of indirect costs
Indirect costs refer to the costs of loss of productivity arising from CHD-related morbidity. Indirect costs were calculated by multiplying work absence due to CHD (in days) for both the patient and relevant family members by the mean daily gross earning per person in 2010.

The total community cost was estimated by multiplying the overall cost calculated for the sample group by the ratio of the entire community population divided by the sample population.

Outcome variables

The outcome variable was costs of CHD, including direct and indirect costs.

Independent variables

Independent predictor variables included both individual and township (contextual) characteristics. Individual characteristics were age, sex, ethnicity, annual household income and