An assessment of community health workers' ability to screen for cardiovascular disease risk with a simple, non-invasive risk assessment instrument in Bangladesh, Guatemala, Mexico, and South Africa: an observational study

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Summary

Background Cardiovascular disease contributes substantially to the non-communicable disease (NCD) burden in low-income and middle-income countries, which also often have substantial health personnel shortages. In this observational study we investigated whether community health workers could do community-based screenings to predict cardiovascular disease risk as effectively as could physicians or nurses, with a simple, non-invasive risk prediction indicator in low-income and middle-income countries.

Methods This observation study was done in Bangladesh, Guatemala, Mexico, and South Africa. Each site recruited at least ten to 15 community health workers based on usual site-specific norms for required levels of education and language competency. Community health workers had to reside in the community where the screenings were done and had to be fluent in that community's predominant language. These workers were trained to calculate an absolute cardiovascular disease risk score with a previously validated simple, non-invasive screening indicator. Community health workers who successfully finished the training screened community residents aged 35–74 years without a previous diagnosis of hypertension, diabetes, or heart disease. Health professionals independently generated a second risk score with the same instrument and the two sets of scores were compared for agreement. The primary endpoint of this study was the level of direct agreement between risk scores assigned by the community health workers and the health professionals.

Findings Of 68 community health worker trainees recruited between June 4, 2012, and Feb 8, 2013, 42 were deemed qualified to do fieldwork (15 in Bangladesh, eight in Guatemala, nine in Mexico, and ten in South Africa). Across all sites, 4383 community members were approached for participation and 4049 completed screening. The mean level of agreement between the two sets of risk scores was 96·8% (weighted κ=0·948, 95% CI 0·936–0·961) and community health workers showed that 263 (6%) of 4049 people had a 5-year cardiovascular disease risk of greater than 20%.

Interpretation Health workers without formal professional training can be adequately trained to effectively screen for, and identify, people at high risk of cardiovascular disease. Using community health workers for this screening would free up trained health professionals in low-resource settings to do tasks that need high levels of formal, professional training.

Funding US National Heart, Lung, and Blood Institute and National Institutes of Health, UnitedHealth Chronic Disease Initiative.

Introduction

The burden of non-communicable diseases (NCDs) in low-income and middle-income countries is very high and compounds the effect of the already high burden of infectious diseases.[1,2] Cardiovascular disease is a major contributor to the increasing burden of NCDs in these low-income and middle-income countries.[2] WHO has noted the crucial importance of investing in the prevention of NCDs and of community screening, both for the ability to reach large segments of the population in a cost-effective manner and for building community-based models of care for disease management, which is key to ensuring success in the reduction and management of NCDs.[3,4] Population-based approaches are an important aspect of public health strategies and particularly suited to the needs of low-resource settings, which face resource shortages (both human and fiscal) and need community support and contribution to ensure improved health outcomes.[5]

However, effective screening and appropriate management of patients who are at high risk of NCDs in low-resource settings is difficult owing to restricted human and financial resources.[6] Health worker shortages are noted to be "the greatest impediment to health in sub-Saharan Africa",[6] where the proportion of trained health workers (doctors and nurses) in the region who intend to migrate ranges from 26% to 68%.[6,7]

Lancet Glob Health 2015; 3: e556–63

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Published **Online** July 15, 2015 http://dx.doi.org/10.1016/S2214-109X(15)00143-6

See **Online/Articles** http://dx.doi.org/10.1016/S2214-109X(15)00142-4

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This challenge also extends beyond sub-Saharan Africa to other low-income and middle-income country settings. In Asia Pacific, health personnel estimates range from 29·1 physicians, 14·4 nurses, and three laboratory health workers per 100 000 population in Bangladesh to 237 physicians, 816 nurses, and 97 laboratory health workers per 100 000 population in New Zealand.[8] Task shifting from physicians to nurses in management of NCDs is effective in several countries, including high-income countries.[9] A review of the evidence about nurse-led interventions shows that nurses are effective at the management of diabetes in primary care, outpatient, and community settings and in the reduction of admissions to hospital, days spent in hospital, several readmissions, patient care, and cost savings, even after the cost of the intervention is factored in.[10] Still, the overall shortage of human resources in low-income and middle-income countries restricts the ability of nurses to manage NCDs and suggests the need for task sharing of some of the prevention work with community health workers.[11]

Task shifting to community health workers in NCD management has largely focused on improvement of adherence or lifestyle choices, or of screening for cancer.[12] However, whether community health workers could be effective at both screening for, and monitoring of, people with cardiovascular disease is unclear. Studies are needed to assess the role of community health workers in both screening and monitoring of cardiovascular disease separately because they need different skills and functions that overlap with nurses and physicians. Also, community health workers are often not well trained and many do not have the instruments needed to manage NCDs.[5,13] Furthermore, within the existing health-care system infrastructures in low-income and middle-income countries, the shortage of funding for NCD care, the limited evidence for the best models of care, and scarcity of resources to do laboratory-based assessments for NCD risk factors, such as lipid levels, provide additional challenges to effective screening for high-risk people at the population level.[14]

A non-invasive risk indicator was previously developed and validated using National Health and Nutrition Examination Surveys (NHANES) data in the USA and in several South African cohorts to assess the absolute risk of experiencing a cardiovascular-disease-related event 5 years after assessment.[15,16] The indicator needs sex, age, height, weight, body-mass index (BMI), current smoking status, average systolic blood pressure, and diabetes status, when available, to be collected. We assessed whether community health workers could be effectively trained to do community-based screenings for cardiovascular disease using this non-invasive, risk prediction indicator in low-income and middle-income countries. We aimed to compare the accuracy of the community health workers' risk prediction scoring against those of health professionals.

Methods

Settings, community health worker selection, and participants

This study was done in four countries: Bangladesh, Guatemala, Mexico, and South Africa, which are part of the global network of US National Heart, Lung and Blood Institute and UnitedHealth Group centres of excellence for chronic disease, which total ten country sites representing 18 countries across the world. The four countries in this study recruited community health workers from a combination of rural (Matlab, Bangladesh and Santiago Atitlan, Guatemala), urban (Hermosillo, Mexico), and peri-urban (Khayelitsha, South Africa) sites. Each site recruited at least ten to 15 community health workers on the basis of usual site-specific norms for required levels of education and language competency.

Community health workers are typically people who are employed by government departments of health to assist in delivery of health-care services to offset personnel shortages. Their training is often informal and need based, and their skills are not obtained through degree granting or traditional health professional programmes, such as medical or nursing schools. The minimum number of years in education required at the individual sites were grade 8 for Bangladesh, 3 years of high school for Guatemala, and completion of grade 12 for South Africa. No formal education requirement was needed for community health workers in Mexico, but trainees had all at least completed middle school. Each community health worker had to reside in the community where the screenings were done and had to be fluent in that community's predominant language.

The study population for screening was drawn from the catchment area served by the local community health centres at each of the participating sites. Community health workers were assigned to a specific location within each site and had to visit each household in their assigned location until they recruited 100 eligible people for screening. Community residents aged 35–74 years were deemed eligible for screening and referral. People reporting a previous history of treatment for hypertension, diabetes, or known cardiovascular disease (stroke, myocardial infarction, or angina) were ineligible for screening because they were presumed to have been referred to, or treated in, their local primary health centres at some point before screening. Residents with a measured systolic blood pressure greater than 180 mm Hg were deemed clinically urgent cases. Community health workers did not assess these residents' cardiovascular disease risk, but provided them with an urgent referral for immediate assessment by a health professional (nurse or physician) at the closest health centre. Community health workers screened all remaining eligible participants and assigned them an individual cardiovascular disease risk score, as described below.

The study protocols were reviewed and approved by the individual site ethics and institutional review boards and