Opportunistic Screening for CVD Risk Factors

The Dubai Shopping for Cardiovascular Risk Study (DISCOVERY)

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Background: Comprehensive cardiovascular disease risk factor (CVDRF) screening programs are limited in the developing world. Simplifying screening can increase its utility.

Objectives: The present study aims to estimate the burden of CVDRF in volunteers and the yield of newly discovered CVDRF comparing different sites and nationalities using this screening method.

Methods: Voluntary point-of-care CVDRF screening was conducted in 4 shopping malls, 9 health care facilities, and 3 labor camps in 5 cities in the United Arab Emirates. Follow-up for newly diagnosed diabetes mellitus, hypertension, and dyslipidemia was made 1 month after screening to inquire about physician consultation, confirmation of diagnosis, and lifestyle changes.

Results: A total of 4,128 subjects were screened (43% at malls, 36% at health care facilities, and 22% at labor camps). Subjects were relatively young (38 ± 11 years), predominantly male (75%), and of diverse nationalities (United Arab Emirates: 7%, other Arabs: 10%, South Asians: 74%, other Asians: 5%, and other nationalities: 5%). CVDRF were frequent (diabetes mellitus: 32%, hypertension: 31%, dyslipidemia: 69%, current smokers: 21%, obesity: 20%, and central obesity: 24%). Most subjects (85%) had ≥1 CVDRF, and many (17%) had ≥3 CVDRF. A new diagnosis of diabetes mellitus, hypertension, or dyslipidemia was uncovered in 61.5%, with the highest yield (74.0%) in labor camps. At follow-up of those with new CVDRF, positive lifestyle changes were reported in 60%, but only 33% had consulted a doctor; of these, diagnosis was confirmed in 63% for diabetes mellitus, 93% for hypertension, and 87% for dyslipidemia.

Conclusions: In this relatively young and ethnically diverse cohort, CVDRF burden and yield of screening was high. Screening in these settings is pertinent and can be simplified.

The World Health Organization estimated that in 1998, 78% of the burden of noncommunicable diseases and 85% of cardiovascular disease (CVD) burden arose from low- and middle-income countries [1]. The mortality from ischemic heart disease between 1990 and 2020 has been projected to increase in developing countries by 120% in women and 137% in men [2]. This expected increase is even greater for the Middle East countries and is estimated at 146% in women and 174% in men.

Notably, one-half of the deaths attributable to CVD would occur prematurely in the developing countries compared with only a quarter in the developed countries [1]. In fact, myocardial infarction occurred a decade earlier in the Middle East and South Asia than in Western Europe and North America in the global case-control INTER-HEART (INTERHEART: A Global Study of Risk Factors for Acute Myocardial Infarction) [3] and the regional Gulf RACE (Registry of Acute Coronary Events) [4]. This has considerable economic and social implications on the family and the nation.

Primary prevention of cardiovascular disease risk factors (CVDRF) is a key tool in reducing this epidemic. This entails early detection, lifestyle change, and achieving optimal control of CVDRF. Comprehensive screening programs are required and are an integral part of health care systems in many developed countries. Such comprehensive screening programs can be complex and require substantial health care resources as well as an established health care infrastructure. Even though there is increasing realization of the sharply increasing burden of CVD in the developing countries, systematic screening programs are rare [5]. There is a need for new models of delivering screening that are simple and easily accessible to the population.

The DISCOVERY (Dubai Shopping for Cardiovascular Risk Study) established a simple and opportunistic screening program in 5 cities in the United Arab Emirates (UAE) as part of the World Heart Day campaigns (during September and October 2012). Its point-of-care (POC) testing methodology rendered it very accessible for this economically and ethnically diverse population. It is a

unique program, in that it includes all components of the UAE population. A pilot phase of the study estimated that around one-third of relatively young and ethnically diverse mall shoppers in a major city in the UAE (Dubai) had ≥1modifiable CVDRF that was previously undetected [6].

The present study aims to estimate the burden of CVDRF in volunteers and the yield of newly discovered CVDRF comparing different sites and nationalities using this screening method. There have been no national systematic random sample risk factor surveys in this population and this study, to some extent, helps fill that gap. We also assess the impact of the new diagnosis on the volunteer's lifestyle and health care—seeking behavior.

METHODS

During the World Heart Day celebration of 2012, from the last week of September to the end of October 2012, a free, voluntary CVDRF screening program was offered in 5 major cities of the UAE—Dubai, Abu Dhabi, Sharjah, Fujairah, and Ras al Khaimah. The venues for the screening included 4 shopping malls, 9 outpatient health care facilities, and 3 labor camps (LC). This was an opportunistic sample and was not intended to provide a population-based cohort. The sampling strategy was based on convenience for the investigators and for the participants.

Adults aged 18 years or older were invited to take part. The study used a single-page, standardized questionnaire and data form and standardized methodology for measuring blood pressure (BP), height, weight, waist circumference, capillary nonfasting total and high-density lipoprotein (HDL) cholesterol, and capillary hemoglobin A1c (HbA_{1c}). On-site counseling was delivered by physicians. Arterial BP was measured using a standard method: the mean of 2 consecutive measurements was recorded after the subject had rested for 5 min [7]. Blood pressure was measured using Omron (Kyoto, Japan) upper arm BP monitor M10-IT with international protocol and British Hypertension Society protocol clinical validation. Weight was measured by Omron Body Composition Monitor Bf-511, a clinical validation and Technischer Überwachungs-Verein-certified medical wellness product. Waist circumference was measured, while standing, midway between the lowest rib and the top of the iliac crest directly on the skin or close-fitting clothing using a non-flexible tape measure attached to a spring balance exerting a force of 75 g [3].

POC machines were used with capillary blood samples. Total cholesterol and HDL were measured by Cardiocheck and HbA_{1c} was measured by Clover A1c Glycosylated Hemoglobin Monitoring System (EuroMedix, Leuven, Belgium) compliant with DCCT (Diabetes Control and Complications Trial) reference method and certified to international standards (International Federation of Clinical Chemistry and National Glycohemoglobin Standardization Program) for POC testing during screening and monitoring

of diabetes [8]. All POC machines were calibrated before each session.

Major CVDRF were defined as follows: dyslipidemia was defined as a history of known or treated dyslipidemia (receiving cholesterol-lowering medication) or a measured total cholesterol ≥200 mg/dl or HDL cholesterol <40 mg/dl [9]. Hypertension was defined as a history of known and treated hypertension (receiving antihypertensive medication) or a measured systolic blood pressure ≥140 mm Hg or diastolic blood pressure ≥90 mm Hg [10]. Obesity was defined as a body mass index of ≥30.0 kg/m² using measured height (m) and weight (kg) [11]. Diabetes mellitus was defined as a history of known and treated diabetes (receiving anti-hyperglycemic medication) or a measured HbA_{1c} ≥6.5% [12]. Current smoking was defined as using cigarettes or other tobacco products [13]. Central obesity was defined as waist circumference of ≥102 cm in male and ≥88 cm in female subjects [14].

At 1-month post-screening, a telephone follow-up call was made to those who were identified as having a new risk factor (mean systolic blood pressure ≥140 mm Hg and/or diastolic blood pressure ≥90 mm Hg, HbA_{1c} ≥6.5%, and total cholesterol ≥200 mg/dl). A standardized list of questions were asked to determine whether they had contacted their physicians; had their diagnosis confirmed; and had made dietary, physical activity, or smoking life-style changes.

Consent was taken for screening and use of data for research purposes. Ethical approval from the Medical Research Committee of Dubai Health Authority was obtained (Ref#MRC-07/2012_09).

The medical team supervisors as well as the doctors, nurses, and other health workers within the team were given hands-on training on the content of the questionnaire, the standardized methods for BP, height, waist, and weight measurements, as well as POC measurements of total and HDL cholesterol and HbA_{1c}. A confirmative test with the subject's physician was advised.

Statistical methods

Stata software (version 10, StataCorp LP, College Station, Texas) was used for all analyses. The prevalence of CVDRF in the study cohort was estimated using the number of known and new cases as the numerator and the total number of study participants without missing information for that risk factor as the denominator. Comparisons of prevalence rates were made between recruitment sites and between nationalities with statistical significance at p <0.05 after adjusting for age and sex.

RESULTS

We screened 4,128 subjects with a mean age ± SD of 38 ± 11 years, of whom 3,105 (75%) were male. Screening was undertaken at 3 site categories: 1,775 (43%) in 4 malls; 1,486 (36%) in 9 government or private health care