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Low Awareness of Diabetes as a Major Risk Factor for Cardiovascular Disease in Middle- and High-Income Countries

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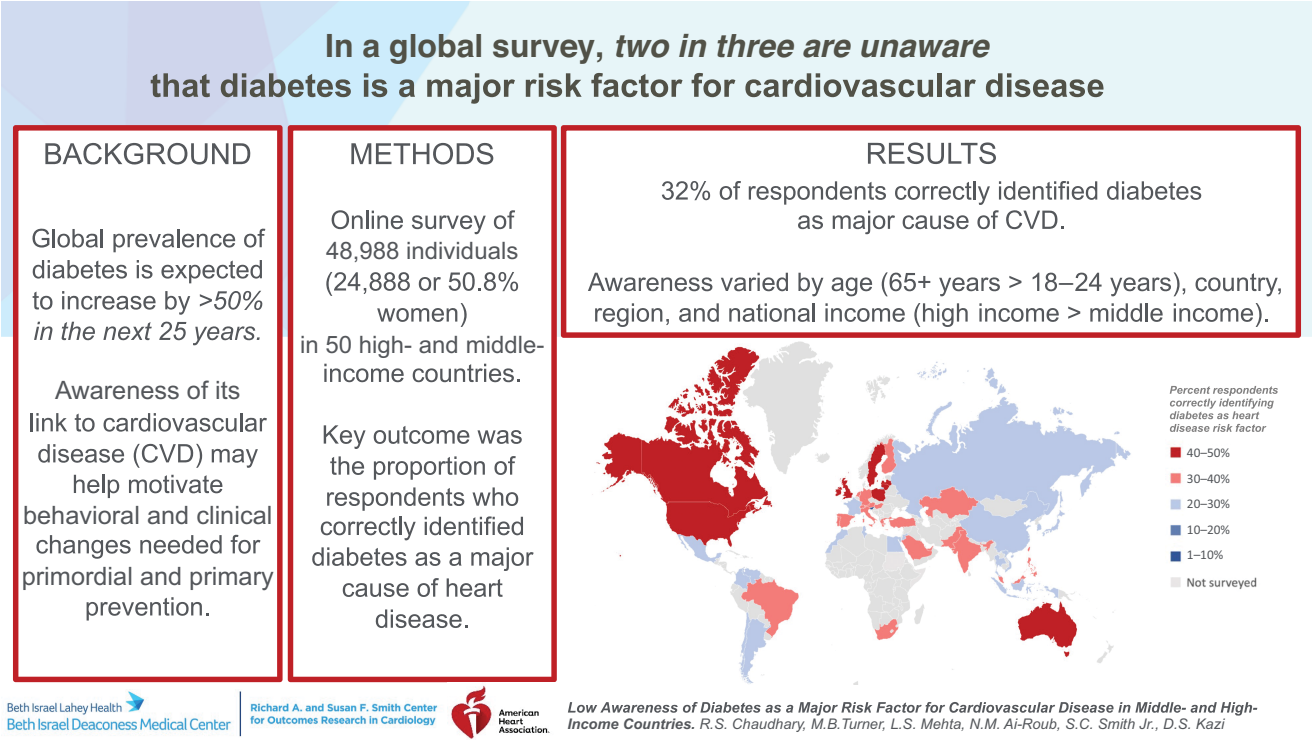

Low Awareness of Diabetes as a Major Risk Factor for Cardiovascular Disease in Middle- and High-Income Countries. *R.S. Chaudhary, M.B.Turner, L.S. Mehta, N.M. Al-Roub, S.C. Smith Jr., D.S. Kazi*

ARTICLE HIGHLIGHTS

- **Why did we undertake this study?**
  The level of global awareness of diabetes as a cardiovascular disease (CVD) risk factor has not previously been characterized and may actually be low.
- **What is the specific question(s) we wanted to answer?**
  This study sought to generate country-level estimates of the awareness of diabetes as a CVD risk factor and examine whether awareness varies by sex, age, country, geographic region, or country-level economic development.
- **What did we find?**
  In 50 high- and middle-income countries, two in three adults were unaware of diabetes as a major CVD risk factor.
- **What are the implications of our findings?**
  Given the projected increase in prevalence of diabetes and CVD, tailored public health awareness campaigns are urgently needed to raise awareness of diabetes as a major CVD risk factor.

Low Awareness of Diabetes as a Major Risk Factor for Cardiovascular Disease in Middle- and High-Income Countries

Richard S. Chaudhary,[1,2] Melanie B. Turner,[3] Laxmi S. Mehta,[4] Nora M. Al-Roub,[1] Sidney C. Smith Jr.,[5] and Dhruv S. Kazi[1,2]

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OBJECTIVE

Awareness of diabetes as a major risk factor for cardiovascular disease (CVD) may enhance uptake of screening for diabetes and primary prevention of CVD.

RESEARCH DESIGN AND METHODS

The American Heart Association conducted an online survey in 50 countries. The main outcome of this study was the proportion of individuals in each country who recognized diabetes as a CVD risk factor. We also examined variation by sex, age, geographic region, and country-level economic development.

RESULTS

Among 48,988 respondents, 15,747 (32.1%) identified diabetes as a major CVD risk factor. Awareness was similar among men and women, but increased with age, and was greater in high-income than in middle-income countries.

CONCLUSIONS

Two-thirds of adults in surveyed countries did not recognize diabetes as a major CVD risk factor. Given the increasing global burden of diabetes and CVD, this finding underscores the need for concerted efforts to raise public health awareness.

The global prevalence of diabetes is projected to rise from 463 million in 2019 to almost 700 million in 2045, a 51% increase over two and a half decades (1,2). This worrisome trend is attributed to an aging population, changing dietary patterns, increasingly sedentary lifestyles, and increasing levels of obesity and is likely to affect all countries regardless of socioeconomic development (3,4). Because individuals with diabetes have a two- to four-times increased risk of atherosclerotic cardiovascular disease (CVD) compared with adults without diabetes (5), the increasing burden of diabetes is projected to produce a corresponding increase in the global CVD burden (6). Recognizing that diabetes is a major risk factor for CVD may motivate lifestyle choices to decrease diabetes risk, promote screening and treatment for diabetes, and boost uptake of primary prevention of CVD (7). However, the level of global awareness of diabetes as a CVD risk factor has not previously been characterized (8). As part of its global quality improvement efforts, the American Heart Association (AHA) designed and implemented a survey to quantify global public awareness

[1]Richard A. and Susan F. Smith Center for Outcomes Research at Beth Israel Deaconess Medical Center, Boston, MA
[2]Harvard Medical School, Boston, MA
[3]American Heart Association, Dallas, TX
[4]The Ohio State University Wexner Medical Center, Columbus, OH
[5]University of North Carolina, Chapel Hill, NC

Corresponding author: Dhruv S. Kazi, dkazi@bidmc.harvard.edu

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of CVD risk factors. This study, which analyzes a subset of these data, sought to generate country-level estimates of the awareness of diabetes as a CVD risk factor and examine whether awareness varies by sex, age, country, geographic region, or country-level economic development.

RESEARCH DESIGN AND METHODS

This is a secondary analysis of an online quality improvement survey administered through the YouGov omnibus platform to participants in 50 countries in 2021. YouGov is one of the world's largest research data and analytics groups, with a panel of >9 million respondents globally who have consented to the use of their responses for research purposes. An e-mail with the survey questions was sent to a selected subset of respondents in 50 countries. The countries were chosen based on the capability of the survey vendor to generate accurate nationally representative estimates from online responses. Within each country, participants were selected from the YouGov panel based on data regarding their age, sex, race, and education (additional survey details are provided in the Supplementary Material). In each country, a nationally representative sample of adults age ≥18 years or older were surveyed in their native language.

The questions and survey format were based on an existing and validated public health awareness survey conducted by the AHA in the U.S. triennially for 15 years and published elsewhere (9). The survey consisted of six questions on topics broadly related to heart disease (Supplementary Table 1). Of relevance to this study, one question asked participants to identify major risk factors for heart disease: "Based on what you know, which, if any, of the following are the major causes of heart disease (please select all that apply)?" Answer choices included high blood pressure, high cholesterol, smoking, being overweight, lack of sleep, diabetes, lack of exercise, poor diet, drinking alcohol, stress, family history of heart disease, other, not applicable, and unknown.

For this study, the outcome of interest was the proportion of survey respondents who correctly identified diabetes as a major cause of CVD. For each country, crude survey results were weighted by age, sex, race, educational attainment, region, and income level to generate nationally representative estimates. We

Table 1—Awareness of diabetes as a risk factor for CVD in middle- and high-income countries

	N of survey respondents	Percentage of respondents who correctly identified diabetes as major risk factor of CVD	*P*
All participants	48,988	32.1	
Sex			0.343
Male	24,888	32.3	
Female	24,100	31.9	
Age group, years			<0.001
18–24	8,227	30.0	
25–34	11,377	30.8	
35–44	9,492	32.0	
45–64	15,096	33.0	
≥65	4,796	36.1	
Country			
Argentina	1,003	29.4	
Australia	1,053	43.1	
Austria	1,001	35.3	
Brazil	1,009	31.9	
Canada	1,005	45.9	
Chile	505	26.3	
China	1,078	21.2	
Colombia	514	27.6	
Egypt	1,035	23.8	
Finland	1,002	37.0	
France	1,014	26.6	
Germany	2,093	31.6	
Greece	507	33.1	
Hong Kong	1,036	33.7	
Hungary	511	30.9	
India	1,177	34.0	
Indonesia	2,013	21.8	
Ireland	1,013	40.2	
Italy	1,056	33.0	
Japan	1,001	29.1	
Jordan	525	26.9	
Kazakhstan	509	30.7	
Latvia	500	39.9	
Lithuania	504	47.3	
Malaysia	1,117	34.9	
Mexico	1,026	29.5	
Morocco	1,125	24.8	
the Netherlands	1,005	31.7	
Pakistan	1,099	36.4	
Philippines	1,119	37.7	
Poland	1,004	42.0	
Portugal	1,026	30.4	
Russia	1,002	28.4	
Saudi Arabia	1,036	31.2	
Singapore	1,022	33.9	
Slovenia	502	7.4	
South Africa	501	34.6	
South Korea	1,004	22.9	
Spain	1,058	30.4	
Sweden	1,013	39.6	
Switzerland	504	32.3	
Taiwan	1,046	32.0	
Thailand	2,031	27.9	
Tunisia	537	19.9	
Turkey	501	33.6	
U.K.	2,117	42.1	
United Arab Emirates	1,039	31.8	
U.S.	1,280	44.8	

Continued on p. 381

Table 1—Continued

	N of survey respondents	Percentage of respondents who correctly identified diabetes as major risk factor of CVD	*P*
Venezuela	500	25.2	
Vietnam	1,110	26.6	
WHO region			<0.001
European (21 countries)	19,442	32.6	
Americas (8 countries)	6,842	36.5	
South-East Asian (3 countries)	5,221	31.8	
Western Pacific (10 countries)	10,586	23.8	
Eastern Mediterranean (7 countries)	6,396	31.2	
African (1 country)	501	34.6	
World Bank country-level income classification			<0.001
Lower-middle income (9 countries)	9,715	31.8	
Upper-middle income (12 countries)	10,816	24.7	
High income (29 countries)	28,457	36.4	

A total of 48,988 participants in 50 countries responded to an online survey about cardiovascular risk factors. The proportion of respondents who correctly identified diabetes as a risk factor for CVD are shown, overall and stratified by sex, age group, country, WHO geographic region, and World Bank income category. Sample weights were used to generate nationally representative estimates for each country.

also examined awareness levels stratified by sex, age group, country, World Health Organization (WHO) region, and World Bank income category. For analyses by region and income category, country-level proportions were weighted by the estimated population in 2022 of the surveyed countries in the region or income category. Cochran-Armitage trend testing was used for comparisons across age categories, and Pearson χ^2 tests were performed for sex, WHO region, and World Bank classification comparisons. Because this analysis relied on deidentified aggregated data collected by YouGov and AHA as part of the global quality improvement survey, it was not considered human subjects research by the institutional review board of Beth Israel Deaconess Medical Center.

RESULTS

A total of 48,988 individuals (50.8% male) from 50 countries responded to the survey (Table 1). The 50 countries represented all six WHO regions and included 29 high-income, 12 upper-middle-income, nine lower-middle-income, and zero low-income countries. A total of 15,747 (32.1%) survey respondents correctly identified diabetes as a major risk factor for CVD. Awareness was similar among men and women (32.3% vs. 31.9%; $P = 0.34$) but increased with age (from 30.0% among respondents age 18–24 years to 36.1% in respondents age >65 years; $P < 0.001$ for trend). Awareness varied by country, ranging from 7.4% in Slovenia to 47.3% in Lithuania (Fig. 1). There were also marked differences by WHO geographic region; awareness was lowest in the Western Pacific region (23.8%) and highest in the Americas (36.5%; $P < 0.001$). High-income countries had higher levels of awareness than lower-middle-income and upper-middle-income countries ($P < 0.001$).

CONCLUSIONS

In an online survey of nationally representative samples of individuals from 50 high- and middle-income countries that collectively account for 454 million adults living with diabetes (10), two in three respondents did not identify diabetes as a major CVD risk factor. These findings are alarming in the context of the substantial projected increase in diabetes over the coming 25 years, given that recognizing the connection between diabetes and CVD may be crucial to individual and systemic investments in primary prevention. Our findings therefore underscore the need for concerted efforts to increase public awareness of this common major CVD risk factor. Low awareness among working-age adults seen in this study is a particular cause for concern, because cardiovascular risk is rising rapidly in this group, and they can derive substantial benefits from preventive efforts (11,12).

Key strengths of this study include the large and diverse sample of respondents representing all WHO regions, with countries representing an aggregate population in excess of 5.5 billion. This is also the first study to characterize awareness of the link between diabetes and CVD on this international scale. A key limitation of this study is that the online nature of the survey precludes accurate assessment of response rates; we are therefore unable to quantify nonresponse bias. Although YouGov makes substantial efforts to ensure a diverse and representative sample of respondents, online surveys may be affected by selection bias in that individuals who engage in an online survey may be systematically different from those who are unable or unwilling to do so. Another limitation is the lack of data on low-income countries. As noted above, selection of countries was based on the capacity of the survey vendor to generate nationally representative estimates based on online responses and was therefore a limitation of the survey mechanism rather than an omission in the survey design. Future surveys should work with online and in-person survey vendors and partner with in-country stakeholders to generate representative results in low-income countries, many of which are likely to see severe epidemics of diabetes and CVD in the coming decades.

The strong link between diabetes and CVD is well established, but there continue to be substantial gaps in the identification and treatment of patients with diabetes, particularly in countries with limited health care resources, such as the low-middle-income countries included in this study (13). Diabetes prevention and control are reliant on individual- and community-level health literacy, lifestyle modification, and social determinants of health, and diabetes treatment requires sustained engagement of the motivated patient with the health system (14,15). Patient awareness of diabetes and its sequelae has been proven to be crucial for improving clinical and psychosocial outcomes; however, awareness levels remain low (16). The knowledge gap identified in our study

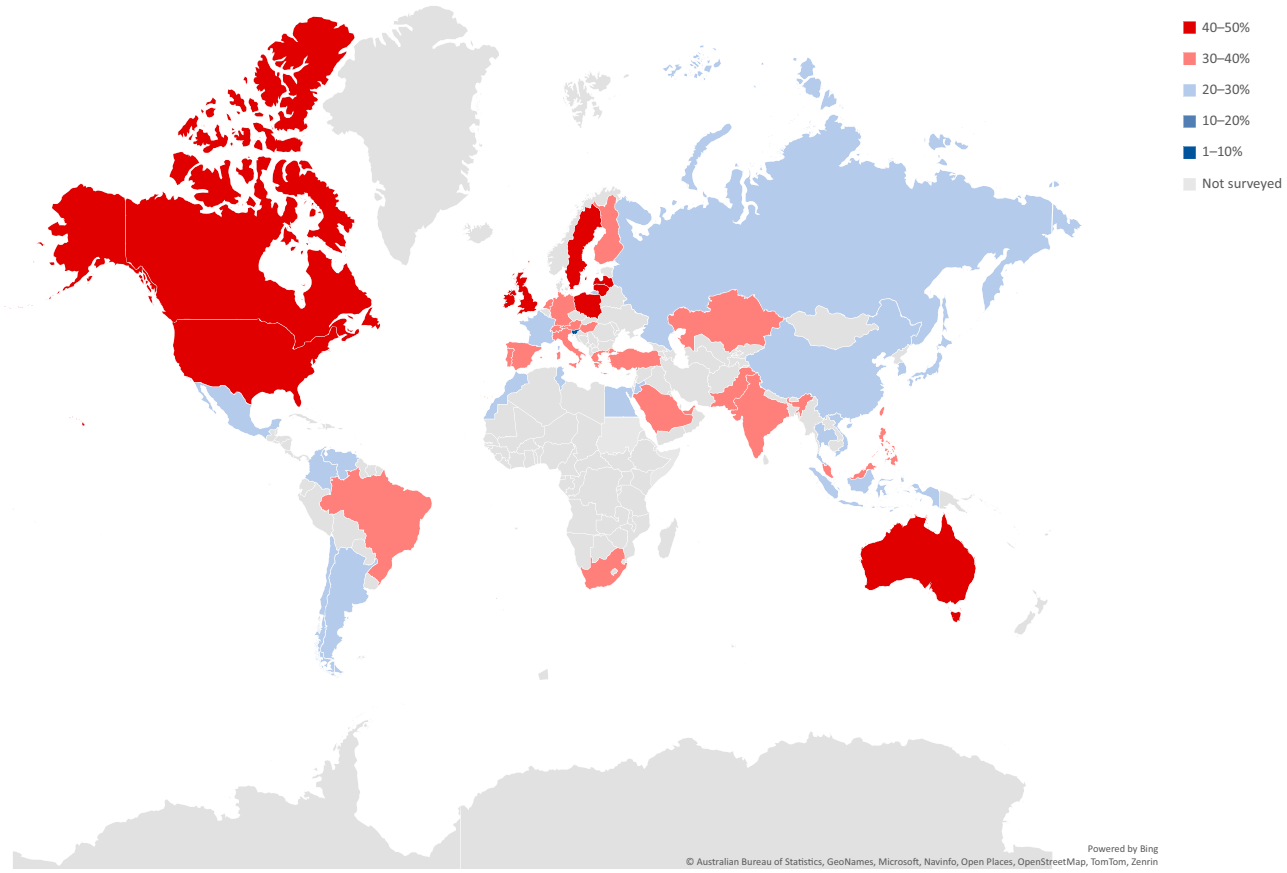

Figure 1—Awareness of diabetes as a risk factor for CVD in 50 middle- and high-income countries. Sample weights were used to generate nationally representative estimates for each country. The proportion of individuals in a country who correctly identified diabetes as a risk factor for cardiovascular disease ranged from 7.4% to 47.3%. Awareness was greater in high-income than in upper-middle- or lower-middle-income countries. Note that because of a limitation of the survey mechanism at the time this study was performed, no low-income countries were included in the analysis.

has important public health consequences. Individuals who do not recognize the cardiovascular risk associated with diabetes may be less likely to make the lifestyle changes necessary to prevent diabetes, get screened and treated once they develop diabetes, or adhere to strategies for CVD prevention. Lack of awareness may fuel misconceptions related to disease prevention and management, further perpetuating the social stigma associated with diabetes in some settings (17).

Addressing this knowledge gap will require a complex multifaceted strategy that includes public health campaigns, patient outreach, and provider engagement (18). These interventions should be tailored by country and age group, given the substantial differences in how different populations now access credible health information. This may be modeled on the successful Go Red for Women initiative, an international campaign to increase awareness of heart disease and stroke in women (19). This program, which was created after a prior AHA survey showed low levels of awareness of CVD in women, is active in 42 countries, with in-country stakeholders regularly organizing provider-, patient-, and community-oriented awareness campaigns. The AHA also recently partnered with the American Diabetes Association to launch Know Diabetes by Heart, a campaign to highlight the link between diabetes and CVD and provide resources and support to help individuals living with diabetes better manage their risk of heart disease and stroke (20). In order for these campaigns to be successful, however, they must be coupled with private and public investments in cost-effective and scalable strategies to support primordial and primary prevention of CVD, including resources to address social determinants of health, assist individuals in making healthy lifestyle choices, and promote appropriate screening of at-risk populations.

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Duality of Interest. M.B.T. is an employee of the AHA. L.S.M. and S.C.S. are volunteer members of the international committee of the AHA. D.S.K. serves as the volunteer co-chair of the international committee of the AHA. No other potential conflicts of interest relevant to this article were reported.

Author Contributions. R.S.C., N.M.A.-R., and D.S.K. analyzed data, created the figure/table and Supplementary Material, and wrote the manuscript. M.B.T. collected data and advised on data analysis. M.B.T., L.S.M., and S.C.S. reviewed and edited the manuscript. L.S.M., S.C.S., and D.S.K. advised on data analysis. R.S.C. and D.S.K. are the guarantors of this work and, as such, had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

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