Weqaya: A Population-Wide Cardiovascular Screening Program in Abu Dhabi, United Arab Emirates

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Objectives. We sought to determine cardiovascular risk factor prevalence rates among adults in Abu Dhabi, United Arab Emirates.

Methods. We used self-reported indicators, anthropometric measures, and blood tests to screen 50 138 adults aged 18 years or older taking part in a population-wide cardiovascular screening program.

Results. Participants' mean age was 36.82 years (SD = 14.3); 43% were men. Risk factor prevalence rates were as follows: obesity, 35%; overweight, 32%; central obesity, 55%; diabetes, 18%; prediabetes, 27%; dyslipidemia, 44%; and hypertension, 23.1%. In addition, 26% of men were smokers, compared with 0.8% of women. Age-standardized diabetes and prediabetes rates were 25% and 30%, respectively, and age-standardized rates of obesity and overweight were 41% and 34%.

Conclusions. This population-wide cardiovascular screening program demonstrated a high cardiovascular burden for our small sample in Abu Dhabi. The data form a baseline against which interventions can be implemented and progress monitored as part of the population-wide Abu Dhabi Cardiovascular Disease Program. (*Am J Public Health.* 2012;102:909–914. doi:10.2105/AJPH.2011.300290)

In 2008, the World Health Organization (WHO) reported that 4 diseases—cardiovascular disease (CVD), cancer, chronic respiratory diseases, and diabetes—account for 60% of all deaths globally, making them the world's biggest killers. In addition, 80% of the deaths associated with these diseases occur in low- and middle-income countries.[1] Data have consistently shown a rapidly rising global burden with respect to noncommunicable diseases, placing them near the top of the World Economic Forum's global risk landscape.[2] The key challenge in alleviating this burden is the development of effective, scalable interventions.

Abu Dhabi is the largest of the 7 emirates that make up the United Arab Emirates (UAE) in the Gulf region of the Middle East. The 2005 UAE census projected a 2010 Abu Dhabi population of 2.3 million residents, with 19% being native Emiratis (median age: 18 years) and the remainder being a mix of Western and Asian expatriates (median age: 31 years).[3] In 2010 CVD accounted for a higher percentage of deaths (more than 27%) than did any other disease,[3] and in the same year the *Diabetes Atlas* reconfirmed the United Arab Emirates as having the world's second-highest prevalence of diabetes.[4]

The *Weqaya* (Arabic for "prevention") population screening program, part of the Abu Dhabi Cardiovascular Disease Program, was developed in accordance with recent United Nations,[5] WHO,[6] World Economic Forum,[7] and Institute of Medicine recommendations[8] for addressing CVD at the population level. Our aim in this study was to determine the cardiovascular risk profile of Abu Dhabi's Emirati population.

METHODS

The *Weqaya* cardiovascular program commenced in Abu Dhabi in April 2008. Individuals aged 18 to 75 years seeking to enroll in the UAE government's new free, comprehensive health insurance plan, which was made available to all UAE nationals residing in Abu Dhabi, were required to undergo screening for cardiovascular risk factors. The *Weqaya* program was overseen by the Health Authority of Abu Dhabi. Screening and clinical follow-ups were conducted by the Abu Dhabi Health Services Company, a government-owned health care provider, and the insurance plan was administered by Daman, a government-linked health insurer. Program recruitment was driven through a national awareness campaign including all 3 entities.

Twenty-five primary care screening centers were established with clear standard operating procedures, regular staff training, and standardized screening methodology. Interviews were conducted by trained nursing staff using a standard form and questionnaire, after which laboratory testing was conducted. Clinical and laboratory data were entered centrally by trained data-entry staff from the Abu Dhabi Health Services Authority. Individuals with abnormal clinical findings were invited back to the clinics for follow-up diagnostic testing and management.

The screenings included collection of information on demographic characteristics, self-reported indicators, anthropometric measures, and blood testing. Demographic data included age, gender, and nationality. Self-reported indicators included smoking status, preexisting CVD (angina, heart attack, transient ischemic attack, stroke, or other circulatory disorder), and a family history of premature cardiovascular disease (a first-degree relative with a heart attack or stroke before the age of 50 years). Beginning in April 2009, information was collected on self-reported history of cardiovascular risk factors for diabetes, hypertension, and dyslipidemia and whether participants were taking medication for these risk factors.

Anthropometric measures included waist and hip circumference (to derive waist–hip ratio), body mass index (BMI; defined as weight in kilograms divided by the square of height in meters), and a single arterial blood pressure reading.

A digital automatic blood pressure monitor was used to measure blood pressure from the left arm with the patient relaxed and seated. Participants' waist circumference (a measure of central obesity) was measured while they were standing and after they had removed outer or bulky clothing. Measurements were taken at the umbilicus and the hip circumference. Height (cm) and weight (kg) were measured while participants were wearing light indoor clothing.

Blood testing included nonfasting glucose (mmol/L), low-density lipoprotein (LDL) and high-density lipoprotein (HDL) cholesterol (mmol/L), and glycosylated hemoglobin (HbA1c; percentages standardized to the Diabetes Control and Complications Trial reference assay[9]) samples.

We restricted our analyses to data collected from April 1, 2009, to June 30, 2010, so that we could include information on self-reported past history of cardiovascular risk factors.

Participants with a BMI of 25 to 29.9 were categorized as overweight, and those with a BMI of 30 or greater were categorized as obese.[10] Central obesity was defined as a waist–hip ratio of 0.85 or greater among women and 0.9 or greater among men.[11]

Participants who had no past history of diabetes requiring medication but had an HbA1c between 5.7% and 6.4% were classified as having prediabetes; those with a past history of adult-onset diabetes requiring medication, an HbA1c of 6.5% or greater, or a random glucose reading of 11.1 millimoles per liter were categorized as having diabetes.[12] Hypertension was defined as a self-reported past history of high blood pressure requiring medication or a single elevated clinical blood pressure reading (systolic blood pressure of ≥140 mmHg or diastolic blood pressure of ≥90 mmHg).[13]

Dyslipidemia was defined as either a self-reported past history of abnormal cholesterol levels requiring medication or a measured LDL cholesterol level of 4.1 millimoles per liter or greater or HDL cholesterol level of 1.0 millimoles per liter or less.[14] Finally, participants who had smoked at least 1 cigarette per day during the previous 12 months, 1 cigar or pipe per week during the previous 12 months, or 1 water pipe per month during the previous 3 months were defined as current smokers.[15,16]

We used Stata version 10.0 (StataCorp LP, College Station, TX) in conducting all of the statistical analyses. Frequencies were compared with age-adjusted P values obtained via logistic regression. We used the screened sample as the denominator in calculating crude prevalence rates.[3] The WHO world reference population was used in deriving age-standardized prevalence rates.[17] The level of statistical significance was set at .05.

RESULTS

The study included 50138 participants, representing 28.9% of the total screened population of Emiratis residing in Abu Dhabi; 35898 (72%) participants were categorized as Emirati, and nationality was recorded as missing for 14240 (28%) participants. Complete measured data were available for 98.7% to 99.9% of the sample, and complete self-reported data were available for 86.1% to 99.8% of the sample, depending on the data field concerned.

Participants' mean age was 36.8 years (SD=14.3; 95% confidence interval [CI]=36.7, 37.0); women were slightly older than men on average (Table 1). Approximately 57% of the participants were women.

A comparison of our study cohort with all of the individuals screened in the *Weqaya* study (n=173501) showed that the overall population was younger, with a mean age of 34.6 years (SD=13.54; 95% CI=34.5, 34.7). A comparison of the *Weqaya* study cohort with the Abu Dhabi population as a whole[3] revealed no underrepresentation in the *Weqaya* cohort, with the exception of the 20- to 24-year age group; this age group composed 16.9% (95% CI=16.4%, 17.4%) of the study cohort and 20.9% (95% CI=20.7%, 21.1%) of the Abu Dhabi population.

There were no significant gender differences between our study cohort and the individuals screened in the *Weqaya* study as a whole. The percentage of men in our study was 43.2% (95% CI=42.8%, 43.6%), compared with 43.7% (95% CI=43.4%, 44.0%) in the overall cohort.

Table 2 shows that many participants had multiple cardiovascular risk factors. This overlap was most evident in diabetic patients, among whom (despite having a lower smoking rate than other groups) 54% were obese, 82% were centrally obese, 73% had dyslipidemia, and 59% were hypertensive.

Table 3 shows crude and age-standardized prevalence rates for cardiovascular risk factors. The crude obesity rate was higher among women than among men (38% vs 32%), whereas crude overweight (29% vs 36%) and central obesity (52% vs 59%) rates were lower among women. The prevalence of dyslipidemia was higher among men than women (58% vs 34%). The crude rate of diabetes in the study cohort was 18%; 27% of the participants had prediabetes, with a higher prevalence among men than among women. Age-standardized rates revealed higher prevalence rates for all risk factors, except for smoking. Of particular note are the high rates of obesity (41%), diabetes (25%), and prediabetes (30%) after age standardization.

Table 4 shows that 49% of men and 34% of women were already either overweight or obese by ages 18 to 20 years. Only 11% of women aged 50 to 59 years were of normal weight. Twenty-eight percent of men and 21%

TABLE 1—Characteristics of the *Weqaya* Study Cohort: Abu Dhabi, United Arab Emirates, 2009–2010

Characteristic	Men, Mean (SD) or Median (IQR)	Women, Mean (SD) or Median (IQR)	Overall, Mean (SD) or Median (IQR)
Age, y	36.57 (14.47)	37.02 (14.16)	36.82 (14.30)
Body mass index, kg/m^2	27.94 (6.14)	28.68 (7.03)	28.36 (6.67)
Waist–hip ratio	0.91 (0.08)	0.85 (0.10)	0.88 (0.10)
Glycosylated hemoglobin, %	5.70 (5.00–6.40)	5.70 (5.00–6.40)	5.70 (5.00–6.40)
Low-density lipoprotein cholesterol, mmol/L	3.00 (0.97)	2.86 (0.91)	2.92 (0.94)
High-density lipoprotein cholesterol, mmol/L	1.00 (0.64–1.36)	1.25 (0.79–1.71)	1.13 (0.67–1.59)
Systolic blood pressure, mmHg	122.83 (15.80)	116.29 (16.85)	119.12 (16.72)
Diastolic blood pressure, mmHg	75.19 (10.46)	71.26 (10.73)	72.96 (10.79)

Note. IQR = interquartile range.

TABLE 2—Comorbid Conditions Among Screened Participants in the *Weqaya* Study Cohort: Abu Dhabi, United Arab Emirates, 2009–2010

	Obesity, No. (%)	Overweight, No. (%)	Central Obesity, No. (%)	Dyslipidemia, No. (%)	Hypertension, No. (%)	Smoking, No. (%)	Prediabetes, No. (%)	Diabetes, No. (%)
Obesity			12 115 (69.0)	9123 (53.5)	5666 (33.1)	1822 (10.42)	5313 (31.7)	4523 (27.0)
Overweight			8995 (56.9)	7318 (47.3)	3320 (21.4)	1978 (12.6)	4258 (27.8)	2565 (16.7)
Central obesity	12 115 (44.9)	8995 (33.4)		14 355 (53.8)	8464 (32.7)	3268 (12.0)	7512 (28.5)	6983 (26.5)
Dyslipidemia	9123 (42.8)	7318 (34.3)	14 355 (66.3)		6836 (32.6)	3478 (16.1)	5689 (27.6)	5851 (28.4)
Hypertension	5666 (51.5)	3320 (30.2)	8464 (74.4)	6836 (63.3)		1183 (10.5)	2608 (24.8)	4665 (44.4)
Smoking	1822 (10.4)	1978 (34.4)	3268 (56.4)	3478 (60.9)	1183 (20.7)		1622 (28.7)	708 (12.5)
Prediabetes	5313 (40.8)	4258 (32.7)	7512 (57.2)	5689 (43.6)	2608 (19.9)	1622 (12.4)		
Diabetes	4523 (54.3)	2565 (30.8)	6983 (81.9)	5851 (72.8)	4665 (58.9)	708 (8.3)		

of women had diabetes or prediabetes by ages 18 to 20 years; by ages 40 to 49 years, more than 60% of the participants had either prediabetes or diabetes. Smoking rates were highest among men aged 20 to 29 years (29%) and 30 to 39 years (32%).

Overall, 5% of the participants (6% of women and 4% of men) were morbidly obese (BMI of ≥40 kg/m^2). Of those meeting the criteria for diabetes, 35% were newly diagnosed, and 65% reported a past history of the disease. Of those previously diagnosed, 90% reported taking antiglycemic medications.

A more detailed analysis of dyslipidemia showed that 37% of participants had abnormal measured LDL or HDL cholesterol levels, compared with a crude prevalence of dyslipidemia of 44% when self-reported data were also included. Among those not on a lipid-lowering medication who had measured abnormal cholesterol levels, 14% had elevated LDL levels and 27% had low HDL levels.

DISCUSSION

The population-wide cardiovascular screening program described here demonstrated a significant cardiovascular burden in the United Arab Emirates. Our results confirm previously reported UAE cardiovascular risk factor rates (e.g., the second-highest rate of diabetes worldwide) and show excesses of other risk factors such as prediabetes, obesity, central obesity, and dyslipidemia. Our findings also demonstrate that Abu Dhabi's age-standardized rates for these risk factors are among the highest reported globally. Our study is among the first to use the newly recommended diabetes diagnostic criterion of an HbA1c of 6.5% or greater at the population level.[12] Data from this study are being used to implement and track the impact of the population-wide Abu Dhabi Cardiovascular Disease Program.

TABLE 3—Crude and Age-Standardized Cardiovascular Risk Factor Prevalence Rates: *Weqaya* Study Cohort, Abu Dhabi, United Arab Emirates, 2009–2010

	Crude Prevalence Rate				Overall Age-Standardized
Risk Factor	Men, % (95% CI)	Women, % (95% CI)	P[a]	Overall	Prevalence Rate,[b] % (95% CI)
Obesity	31.6 (31.0, 32.2)	38.3 (37.8, 38.9)	<.001	35.4 (34.6, 35.4)	41.1 (40.7, 41.5)
Overweight	36.1 (35.4, 36.7)	28.8 (28.2, 29.3)	<.001	31.9 (31.5, 32.3)	34.0 (33.6, 34.4)
Central obesity	58.6 (58.0, 59.3)	51.9 (51.3, 52.5)	<.001	54.8 (54.4, 55.2)	62.4 (61.9, 62.8)
Dyslipidemia	57.7 (57.0, 58.3)	33.9 (33.3, 34.5)	<.001	44.2 (43.7, 44.6)	50.7 (50.3, 51.2)
Hypertension	26.0 (25.4, 26.6)	20.9 (20.5, 21.4)	<.001	23.1 (22.7, 23.5)	29.2 (28.8, 29.6)
Smoking	25.8 (25.2, 26.4)	0.8 (0.7, 0.9)	<.001	11.6 (11.3, 11.9)	11.3 (11.0, 11.6)
Prediabetes	27.8 (27.2, 28.4)	26.5 (26.0, 27.0)	<.01	27.1 (26.7, 27.5)	29.5 (29.1, 29.9)
Diabetes	17.3 (16.8, 17.8)	17.9 (17.4, 18.3)	.08	17.6 (17.3, 17.9)	24.6 (24.2, 25.0)

Note. CI = confidence interval.
[a]Adjusted for age.
[b]Age standardized against the World Health Organization standard.[17]

Strengths and Limitations

This ongoing clinical program had recruited 92% of the Abu Dhabi population at the time of our analysis, which makes it unique in the Middle East and one of the few such programs worldwide. As mentioned, a comparison of our sample with the Abu Dhabi population as a whole reveals underrepresentation of the 20- to 24-year age group. Possible reasons are that individuals in this age group were abroad for educational purposes and that they lacked engagement with the health care system because of their lower perceived or actual need for health coverage. There may also have been inaccuracies in the population figures used as denominators here, which were derived from a 2005 census projection.

The likelihood of recruitment bias in the *Weqaya* screening program is relatively low because of the program's high level of population capture; however, such bias remains a possibility, particularly as a result of the link with health insurance. Our sample did not include participants enrolled in the first year of the program, which may have resulted in omission of individuals with higher risk-factor levels, thus leading to underestimates of prevalence rates.

Because this was a population-based clinical program, there were limitations in the methods used for recording of some measures. For example, it was not possible to distinguish between type 1 and type 2 diabetes with our methodology. However, it is likely that the prevalence of type 1 diabetes was low, similar

TABLE 4—Crude Cardiovascular Risk Factor Prevalence Rates, by Age and Gender: *Weqaya* Study Cohort, United Arab Emirates, 2009–2010

	Age Group, y, No. (%)							
Risk Factor	18–20	20–29	30–39	40–49	50–59	60–69	70–79	≥80
Male respondents								
Obesity	41 (27.7)	2339 (26.5)	2013 (36.2)	956 (35.7)	736 (37.5)	484 (31.9)	180 (27.2)	19 (21.8)
Overweight	32 (21.6)	2675 (30.3)	2156 (38.8)	1173 (43.8)	796 (40.6)	610 (40.2)	259 (39.1)	24 (27.6)
Central obesity	56 (37.8)	3549 (39.9)	3456 (61.8)	2052 (76.0)	1616 (81.5)	1324 (85.0)	580 (83.0)	66 (71.0)
Dyslipidemia	56 (37.8)	4194 (47.7)	3234 (58.7)	1772 (67.2)	1367 (71.8)	1080 (74.1)	462 (69.9)	57 (64.8)
Hypertension	25 (17.7)	1275 (14.4)	955 (17.3)	838 (32.1)	946 (50.4)	994 (67.1)	446 (66.3)	44 (48.4)
Smoking	26 (17.7)	2541 (28.7)	1765 (31.6)	663 (24.6)	303 (15.3)	196 (12.6)	66 (9.5)	10 (10.8)
Prediabetes	36 (24.7)	2091 (23.8)	1719 (31.5)	935 (36.2)	550 (29.6)	320 (22.0)	166 (25.5)	23 (26.7)
Diabetes	6 (4.1)	242 (2.8)	502 (9.2)	646 (25.0)	886 (47.7)	896 (61.7)	413 (63.4)	34 (39.5)
Female respondents								
Obesity	39 (15.9)	2380 (21.9)	2830 (38.6)	2150 (55.3)	2033 (64.9)	969 (54.7)	356 (45.6)	31 (26.3)
Overweight	43 (17.6)	2792 (25.7)	2455 (33.5)	1207 (31.0)	800 (25.5)	520 (29.4)	242 (31.0)	38 (32.2)
Central obesity	66 (26.5)	3801 (34.7)	3548 (48.1)	2455 (62.8)	2477 (78.1)	1576 (85.9)	767 (88.9)	91 (73.4)
Dyslipidemia	42 (17.1)	2108 (19.4)	1953 (26.9)	1645 (43.6)	1840 (61.2)	1223 (70.1)	570 (69.2)	52 (44.1)
Hypertension	26 (10.4)	719 (6.6)	723 (9.9)	956 (25.3)	1565 (52.5)	1160 (66.4)	635 (75.1)	69 (56.1)
Smoking	2 (0.8)	82 (0.8)	66 (0.9)	36 (0.9)	23 (0.7)	9 (0.5)	3 (0.4)	0 (0.0)
Prediabetes	49 (20.1)	2362 (21.9)	2130 (29.5)	1303 (35.3)	818 (27.9)	400 (23.7)	195 (24.6)	29 (24.4)
Diabetes	3 (1.2)	287 (2.7)	534 (7.4)	950 (25.7)	1549 (52.7)	1051 (62.2)	483 (60.9)	46 (38.7)

to a previous estimate from a similar population in Kuwait (<0.3%).[18] Fasting cholesterol samples were not obtained, which may have influenced the results for cholesterol levels. A single elevated clinical blood pressure reading (along with a known history of hypertension requiring treatment) was used to define hypertension, possibly leading to overestimated hypertension rates in our population. However, the hypertension rate was considerably lower in our population (23%) than in the US National Health and Nutrition Examination Survey (NHANES) population between 1988 and 2008 (29%).[19]

Prevalence of Cardiovascular Risk Factors

The rates of obesity, overweight, and central obesity observed in our relatively young population were alarmingly high, at 35%, 32%, and 55%, respectively. A UAE cross-sectional survey conducted in 2000 revealed an overall UAE obesity rate of 34% (40% among women and 26% among men).[20] The rates reported in the *Weqaya* program were identical to those reported in the 2005–2006 NHANES among respondents aged 20 to 74 years (35% obese and 32% overweight)[21] but were higher than those reported in the 2007 Health Survey for England (obesity rates of 24% among men and 23% among women)[22]; the rate of morbid obesity was lower in Abu Dhabi than in the 2005–2006 NHANES (6.2%).[21] The age-standardized rates of obesity in our sample were considerably higher than were those in the United States and the United Kingdom.

Our results confirm WHO and International Diabetes Federation findings showing that the United Arab Emirates has the world's second-highest rate of diabetes.[4,21] At 18%, the rate falls within the range of diabetes prevalence rates reported previously in the country. A 2005 household survey of 30 548 nationals from Abu Dhabi showed a rate of 19%[3]; a 2007 study involving 373 nationals in Al Ain, Abu Dhabi, revealed a rate of 17%[23]; and a 2007 household survey revealed a rate of 25% among nationals (as well as a very high rate of 20% among respondents who were not nationals).[20] The reason for the higher rates in the latter study may be that the population of Al Ain is not representative of the Abu Dhabi population as a whole. There are higher levels of consanguinity in Al Ain (>54%)[24] than in other areas of Abu Dhabi, leading to the possibility of greater genetic influences as well as differences in environmental factors owing to a more rural lifestyle.

The diabetes rates observed in the *Weqaya* study are likely to be more representative than are those observed in other regional investigations because the study's sample was larger, it was less prone to selection bias, and it involved the use of HbA1c in diagnosing diabetes. Alternatively, the differences in diabetes rates may represent a true reduction in the prevalence of the disease. A reduction in the prevalence of cardiovascular risk factors has occurred in some high-income countries as a result of behavior change and improved health care access.[25]

The prediabetes rate (27%) was very high relative to the rates reported in the 2000 UAE cross-sectional survey (5%–7%),[20] probably at least in part because of differences in methodology. Studies of other high-risk non-White populations have reported 5-year conversion rates to diabetes of 22% among Mauritians with impaired fasting glucose[26] and 41% among Pima Indians with impaired fasting glucose and impaired glucose tolerance.[27] A 41% conversion rate in Abu Dhabi would take the diabetes prevalence rate to 29% by 2014. This alarmingly high prevalence, along with the increased independent risk of developing diabetes and CVD, provides strong justification for aggressive interventions targeting prediabetes in the Abu Dhabi population.

The use of HbA1c as a diabetes measure involves both advantages and disadvantages. The advantages include simplicity, standardization, low day-to-day variability, and lack of need for prior fasting or restriction in time of measurement,[28] making this diagnostic method suitable for population-level screening. Furthermore, HbA1c is widely used as an indicator of diabetes control and has been shown to be independently predictive of cardiovascular risk.[29] HbA1c levels fluctuate less from day to day than do 2-hour postload glucose levels, which can reflect day-to-day differences in insulin secretion and insulin action.[28] As such, HbA1c better assesses glycemic trends over several months, whereas 2-hour postload glucose better assesses immediate glucose homeostasis.

There is substantial interindividual variation in HbA1c at the same levels of glycemia, reflecting differences in red cell penetration and half-life, glycation, vitamin and medication status, and other factors.[28] This variation would presumably make it more difficult for HbA1c measurements to distinguish small differences in glycemia (e.g., prediabetes vs normal glucose levels).[28] It also explains the lower reliability of HbA1c in populations with high levels of anemia and hemoglobinopathies.

Studies have shown ethnic differences in HbA1c levels, with Afro-Caribbean populations in the United States having higher HbA1c levels at similar levels of glycemia than the native US population.[30] Studies have also shown higher rates of false-positive results and lower rates of false-negative results in Afro-Caribbean populations, which may result in overdiagnosis of diabetes.[30] It is unknown how such ethnic differences might affect the use of HbA1c in a Middle Eastern Gulf population. A study in Finland showed that elevated HbA1c, impaired glucose tolerance, and impaired fasting glucose preceded diabetes in 32.8%, 40.6%, and 21.9% of cases, respectively, suggesting that prediabetes diagnosed via HbA1c may be less predictive of progression to diabetes than are oral glucose tolerance tests.[29]

Our results showed that rates of hypertension were low relative to rates in other countries (32% in the 2004 Health Survey for England[31] and 29% in the NHANES between 1988 and 2008[19]) and to the otherwise high burden of risk factors in the *Weqaya* program population. The age-standardized rate, however, was close to the NHANES rate, suggesting that a large proportion of this difference in prevalence rates is a result of the overall young age of the Abu Dhabi population. It may also reflect a preponderance of obesity-related risk (diabetes and prediabetes) in Abu Dhabi.

Rates of dyslipidemia were high, with the majority of individuals being newly diagnosed with high LDL and low HDL levels. In our sample, low HDL levels were a far greater contributor to dyslipidemia than were high LDL levels. This discrepancy may be partly explained by treatment with statins, which has different effects on LDL and HDL levels. There may also be a true preponderance of metabolic syndrome characteristics in the Abu Dhabi population, including HDL but not LDL cholesterol, that predispose individuals to diabetes.

Smoking rates were high among young male respondents but considerably lower overall than in the majority of other Middle Eastern countries, where male smoking rates are mostly in excess of 30%.[16] Although noncigarette tobacco use was specifically recorded, it was probably underreported. The smoking rates observed among women were lower than those of any other Middle Eastern country.[16]

Conclusions

The population-wide cardiovascular screening program described here demonstrated a significant cardiovascular risk factor burden in Abu Dhabi. Our results provide a baseline for longitudinal follow-up of cardiovascular (and other chronic) diseases and the potential to fully investigate the epidemiology, causation, and natural history of CVD. Not only do our data greatly enhance understanding of cardiovascular disease in Abu Dhabi; more important, they are being used to implement a population-wide cardiovascular intervention program. ■

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Contributors

C. Hajat designed the study, conducted the data analysis and interpretation, and wrote the article. O. Harrison and Z. Al Siksek contributed to the study design and the review of the article.

Human Participant Protection

This study was approved by the Abu Dhabi Health Research Council. All participants provided written informed consent.

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