Low Prevalence of AHA-Defined Ideal Cardiovascular Health Factors

A Study of Urban Indian Men and Women

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ABSTRACT

Background: Coronary heart disease risk factors are widely prevalent among urban subjects in India but the prevalence of good cardiovascular health is unknown.

Objectives: This multisite study sought to determine the prevalence of American Heart Association–defined ideal cardiovascular health factors.

Methods: The study was performed in 11 cities using cluster sampling. Middle-class urban subjects ages 20 to 75 years (N = 6,198; men: 3,426; women: 2,772, response: 62%) were evaluated for socioeconomic, biophysical, and biochemical factors. Prevalence of ideal cardiovascular health using 7-factor American Heart Association metric (nonsmoking, moderate or greater physical activity, low-fat, high-fruit/vegetable diet, body mass index <25 kg/m^2, untreated blood pressure <120/<80 mm Hg, cholesterol <200 mg/dl, and fasting glucose <100 mg/dl) was determined. Descriptive statistics are reported.

Results: Age-adjusted prevalences of ideal health factors in men and women, respectively, were non-tobacco use in 72.0% and 89.6%, moderate physical activity in 20.1% and 20.6%, healthy diet in 10.6% and 10.6%, normal body mass index in 57.7% and 52.8%, normotension in 17.1% and 22.4%, normocholesterolemia in 72.4% and 72.7%, and normoglycemia in 57.4% and 59.5%. Prevalence of all the 7 health factors was in <1.0% in both men and women, any 6 in 3.4% and 3.5%, any 5 in 12.7% and 17.8%, any 4 in 36.9% and 44.7%, any 3 in 67.2% and 70.8%, any 2 in 89.1% and 92.4%, and 1 in 98.2% and 99.1%. Cardiovascular health was poor (1 to 3 factors) in 62.4% of men and 54.9% of women, average (4 to 5 factors) in 34.1% and 41.5%, and good (≥6 factors) in 3.5% and 3.6%. With increasing age, the behavioral health factors (tobacco use, physical activity, healthy diet) did not change, whereas others declined ($p_{trend} < 0.01$). Clustering of average and good health factors also declined with age ($p_{trend} < 0.01$). There were no socioeconomic status–related differences in prevalence of good cardiovascular health.

Conclusions: Good cardiovascular health factors—physical activity, healthy diet, and desirable body mass index, blood pressure, and glucose levels—are low in urban Asian Indians.

Attaining and sustaining good health is important [1]. There is, justifiably, a high emphasis on good health in children and young women to prevent childhood and maternal diseases in India [2]. However, in the 21st century, noncommunicable diseases such as cardiovascular diseases are the principle causes of morbidity and mortality in India, and promotion of good cardiovascular health is important [3]. In the United States, the Healthy People 2020 initiative has focused on measures to promote cardiovascular health using population-wide strategies [4]. These strategies include policy initiatives and clinical strategies [4]. The American Heart Association (AHA) developed a 7-point metric for assessment of cardiovascular health that could be used for population-based surveillance [5]. This metric includes 3 positive health behaviors (nonsmoking, moderate or vigorous work-related or leisure time physical activity, and low-fat, high-fruit/vegetable diet) and 4 biological health measures: body mass index (BMI) <25 kg/m^2; untreated blood pressure (BP) <120/<80 mm Hg; total cholesterol <200 mg/dl (<5.2 mmol/l); and normal fasting glucose <100 mg/dl (<5.6 mmol/l) [5].

Only a few studies [6–14] have determined prevalence of cardiovascular health using the AHA 7-point metric. Low prevalence of ideal cardiovascular health status was reported in the United States [6] with substantial regional variations [7]. Studies in Europe also reported a low prevalence of ideal cardiovascular health [8,9]. A study of more than a million subjects in China reported that prevalence of health factors was ideal in 1.5%, intermediate in 33.9%, and poor in 64.6% [10]. Analysis of the data from

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the U.S. NHANES (National Health and Nutrition Evaluation Surveys) showed increasing cardiovascular health in the country and cardiovascular health scores increased from the initial surveys in 1999 to 2000 to surveys performed in 2005 to 2006 and were projected to comply with the U.S. target of Healthy People 2020 [11]. Prospective evaluation of cardiovascular health factors revealed that a declining cardiovascular health matrix is associated with greater all-cause, cardiovascular, as well as ischemic heart disease mortality [12–14]. We performed the India Heart Watch to determine prevalence of cardiovascular risk factors and cardiovascular health in 11 cities in India [15]. Data on prevalence of hypertension, hypercholesterolemia, and metabolic syndrome have been reported [16–18]. To determine prevalence of good cardiovascular health using the AHA 7-point metric, we performed the present study.

METHODS

A multisite study to identify prevalence of cardiovascular risk factors and their sociodemographic determinants was organized among urban subjects in India. The rationale for the study has been reported [19]. The protocol was approved by the institutional ethics committee of the national coordinating center (Fortis Escorts Hospital, Jaipur, India; USA-Federal Wide Assurance Number 00017762, India-DCGI Registration Number ECR/46/Inst/RJ/2013). Written informed consent was obtained from each participant. The study case report form was developed according to recommendations of the World Health Organization (WHO) [20].

Regions and investigators

We planned the study to identify prevalence of cardiometabolic risk factors, cardiovascular health factors, and their determinants in urban subjects in India [15]. Briefly, medium-sized cities (population ranging from 0.5 to 5 million) were identified in each of the large states of India, and investigators who had a track record of research in cardiovascular or diabetes epidemiology were invited for participation in the study as reported earlier [15]. Twenty investigators were invited from all large states of India, and 15 agreed to participate. At initiation of the study, a steering committee and investigators' meeting was organized at which the study protocol was discussed and developed. The meeting was followed by training in salient features of questionnaires and techniques of examination and evaluation to ensure uniformity in recruitment and data collection. Four investigators dropped out due to nonavailability of technical support and motivation, and 11 investigators in 11 cities finally performed the survey. These cities are in all the geographic regions of the country: northern (Jammu, Chandigarh); western (Bikaner, Ahmedabad); southern (Belgaum, Madurai); central (Nagpur, Jaipur); and eastern (Lucknow, Patna, Dibrugarh). Macrolevel demographic characteristics as well as the human development indexes of the cities excluded from the original 20 sites (Dehradun, Delhi, Hyderabad, Indore, Karnal, Kochi, Kolkata, Raipur, and Ranchi) are comparable [21].

Sampling

The study data were collected in the years 2006 to 2010 at various locations. Simple cluster sampling was performed at each site. A middle-class location was identified at each city. This is based on municipal classification and is derived from cost of land, type of housing, public facilities (e.g., roads, sanitation, water supply, electricity, gas supply), and educational and medical facilities as reported earlier [22]. A sample size of about 250 men and 250 women (n = 500) at each site is considered adequate by WHO to identify 20% difference in mean level of biophysical and biochemical risk factors [20]. We invited 800 to 1,000 subjects in each location to ensure participation of $\geq$500 subjects at each site, estimating a response of 70% as reported in previous studies at similar locations [22]. At each site, a uniform protocol of recruitment was followed. Accordingly, a locality within the urban area of the city was identified on an ad hoc basis by each investigator; the houses were enumerated; the number of subjects $\geq$20 years living in each house was determined; and all these individuals were invited to a local community center or health care facility (clinic, dispensary) for examination and blood investigations. This procedure ensured participation of consecutive members of the locality and was representative even if the survey was prematurely abandoned at a particular location. There are certain limitations of the cluster sampling approach, and they will be discussed later [20]. The surveys were preceded by meetings with community leaders to ensure good participation. Subjects were invited to come in a fasting state to a community center or medical center within each locality either twice or thrice a week depending on the investigator's schedule.

Measurements

The study case report form was filled in by the research worker employed by the site investigator after details were acquired from the subject. Apart from demographic history, details of socioeconomic status based on educational status and years of formal education, type of family, any major previous illnesses, history of known hypertension, diabetes, lipid abnormalities, and cardiovascular disease were acquired. Smoking details were acquired for type of smoking or tobacco use, number of cigarettes or bidis smoked, and years of smoking. Intake of alcohol was assessed as drinks per week. Other details of diet and physical activity were acquired using focused questions [15]. All the equipment for measurements of height, weight, waist and hip size, and blood pressure were similar at the centers to ensure uniformity. Height was measured using stadiometers, weight using calibrated spring weighing machines, and waist and hip circumference was measured using standard WHO guidelines [20]. Sitting BP was measured after $\geq$5 min rest using standardized instruments. Three readings were

obtained and were averaged for the data analysis. Fasting blood samples were obtained from all individuals after ≥10 h of fasting. The blood samples were obtained at community centers by technicians from an accredited national laboratory—Thyrocare Technologies Ltd. (Mumbai, India). Blood glucose was measured at the local biochemistry facility of these laboratories. Blood for cholesterol, cholesterol lipoproteins, and triglycerides estimation was transported under dry ice to the national referral laboratory at Mumbai. All the blood samples were analyzed at a single laboratory and a uniform protocol was used for measurements [17]. Cholesterol, high-density lipoprotein cholesterol, and triglyceride levels were measured using enzyme-based assays with internal and external quality control. Low-density lipoprotein cholesterol was calculated using the Friedwald formula [17].

Diagnostic criteria

Smokers included subjects who smoked cigarettes, bidis, or other smoked forms of tobacco daily; past smokers were subjects who had smoked for ≥1 year and had stopped >1 year ago. Users of other forms of tobacco (e.g., oral, nasal) were classified as smokeless tobacco users. Individuals with greater than moderate physical activity (30 min of work-related or leisure time physical activity, ≥5× a week) were classified as moderately active. Those with dietary intake of low fat (<30 g visible fat intake/day) and ≥3 dishes of fruits or green vegetables/day were classified as having a healthy diet. Hypertension was diagnosed when systolic BP was ≥140 mm Hg and/or diastolic ≥90 mm Hg or when the participant was a known hypertensive. Normotension person had systolic BP <120 mm Hg and diastolic BP <80 mm Hg [16]. Normocholesterolemia was defined as the presence of total cholesterol <200 mg/dl or <5.2 mmol/l [17], and normoglycemia was defined as fasting glucose <100 mg/dl or <5.6 mmol/l. All these criteria are according to the AHA 7-point metric [5].

Statistical analyses

All the data were entered into SPSS database (version 10.0, SPSS Inc., Chicago, Illinois). In >90% of subjects, data for various variables were available, and in about 85% of subjects, data for all the variables were available. Values for men and women have been analyzed separately. Categorical variables are reported as percentages. Age adjustment was performed using the direct method with 2001 Indian census population as standard. Prevalence of cardiovascular health in the study population and in various age groups are reported as percentages. Trends were examined by Mantel-Haenszel chi-squared test for trend. We also determined the association of social factors with poor, average, and good cardiovascular health using logistic regression in various socioeconomic groups. Multivariate age-adjusted nonstratified logistic regression analyses were performed with good cardiovascular health as the comparator group. Age-adjusted odds ratio (OR) and 95% confidence intervals (CI) were calculated. p values <0.05 are considered significant.

RESULTS

The study was performed at 11 cities located in all geographic regions of India. A total of 6,198 subjects (men: 3,426; women: 2,772) of the targeted 9,900 subjects were evaluated (response: 62%). Recruitment at individual sites and data for social and demographic characteristics in men and women has been reported [15].

Age-specific and age-adjusted prevalences of cardiovascular health metric factors in men and women are shown in Table 1. In men and women, respectively, the age-adjusted prevalences of ideal health factors were as follows: nontobacco use in 72.0% and 89.6%; moderate physical activity in 20.1% and 20.6%; healthy diet in 10.6% and 10.6%; normal BMI in 57.7% and 52.8%; normotension in 17.1% and 22.4%; normocholesterolemia in 72.4% and 72.7%; and normoglycemia in 57.4% and 59.5%. Influence of age on healthy habits and factors shows that with increasing age, the behavioral factors (tobacco use, physical activity, healthy diet) did not change, whereas prevalence of desirable BMI, normotension, normocholesterolemia, and normoglycemia declined significantly (Mantel-Haenszel chi-squared test, $p_{trend} < 0.01$) (Table 1).

Prevalence of number of cardiovascular health factors was also determined in various age groups (Table 2). Among men and women, respectively, the prevalence of all the 7 health factors was found in <1.0% in both men and women, any 6 in 3.4% and 3.5%, any 5 in 12.7% and 17.8%, any 4 in 36.9% and 44.7%, any 3 in 67.2% and 70.8%, any 2 in 89.1% and 92.4%, and any 1 in 98.2% and 99.1% (Figure 1). Prevalence of any 3, 4, or 5 health factors were significantly greater in women ($p < 0.01$), and there was no significant difference in prevalence of extremely low or high health factors. Age-specific analyses show that presence of good cardiovascular health (any 4, 5, 6, or 7 health factors) declined with increasing age (Mantel-Haenszel chi-squared test, $p_{trend} < 0.01$, for comparison across individual age groups) (Table 2), whereas the presence of ≤3 factors increased ($p_{trend} < 0.01$). Cardiovascular health was poor (1 to 3 factors) in 62.4% of men and 54.9% of women, average (4 or 5 factors) in 34.1% and 41.5%, and good (≥6 factors) in 3.5% of men and 3.6% of women (Figure 2). Mean age of subjects with good, intermediate, and poor cardiovascular health was 40.2 ± 12, 44.2 ± 14, and 50.2 ± 12 years, respectively ($p < 0.001$).

We also studied the associations of educational status, occupational class, and family status with good, average, and poor cardiovascular health. Age-adjusted OR and 95% CI in various educational, socioeconomic, and family groups were calculated separately. Good cardiovascular health was taken as the comparator group, and OR and 95% CI were determined for the other groups with average cardiovascular health and poor cardiovascular health

TABLE 1. Cardiovascular health factors in various age groups

	20–29 yrs	30–39 yrs	40–49 yrs	50–59 yrs	60–69 yrs	70+ yrs	Chi-Square for Trend, p Value
Men (n = 3,426)	254	573	915	879	539	266	
Nontobacco use	203 (79.9)	390 (68.1)	627 (68.5)	571 (64.9)	384 (71.2)	198 (74.4)	0.536
Moderate or more physical activity	37 (14.5)	128 (22.3)	211 (23.0)	189 (21.5)	122 (22.6)	70 (26.3)	0.030
Healthy diet	27 (10.6)	65 (11.3)	94 (10.3)	86 (9.8)	53 (9.8)	30 (11.3)	0.663
BMI <25 kg/m^2	191 (75.1)	311 (54.3)	415 (45.3)	391 (44.5)	271 (50.3)	154 (57.9)	<0.001
BP untreated <120/80 mm Hg	69 (27.1)	109 (19.0)	92 (10.0)	73 (8.3)	37 (6.8)	22 (8.3)	<0.001
Cholesterol untreated <200 mg/dl	206 (81.1)	431 (75.2)	603 (65.9)	563 (64.0)	341 (63.2)	185 (69.5)	<0.001
Glucose fasting untreated <100 mg/dl	198 (77.9)	337 (58.8)	414 (45.2)	381 (43.3)	196 (36.3)	91 (36.3)	<0.001
Women (n = 2,772)	205	568	786	638	447	128	
Nontobacco use	194 (94.6)	509 (89.6)	677 (86.1)	543 (85.1)	377 (84.3)	117 (91.4)	0.003
Moderate or more physical activity	34 (16.6)	103 (18.1)	166 (21.1)	169 (26.5)	123 (27.5)	43 (33.6)	<0.001
Healthy diet	17 (8.3)	82 (14.4)	77 (9.8)	66 (10.3)	40 (8.9)	15 (11.7)	0.227
BMI <25 kg/m^2	140 (68.3)	306 (53.9)	324 (41.2)	248 (38.9)	178 (39.8)	59 (46.1)	<0.001
BP untreated <120/80 mm Hg	57 (27.8)	184 (32.4)	144 (18.3)	57 (8.9)	40 (8.9)	7 (5.4)	<0.001
Cholesterol untreated <200 mg/dl	184 (89.7)	450 (79.2)	508 (64.6)	359 (56.2)	219 (49.0)	55 (42.9)	<0.001
Glucose fasting untreated <100 mg/dl	157 (76.6)	350 (61.6)	437 (55.6)	268 (42.0)	163 (36.4)	44 (34.4)	<0.001

Values are n or n (%).
BMI, body mass index; BP, blood pressure.

(Table 3). Although there is no statistically significant difference in prevalence of good cardiovascular health with any of these socioeconomic variables, subjects with better educational status (OR: 1.47; 95% CI: 0.95 to 2.27) and higher socioeconomic status (OR: 1.54; 95% CI: 0.62 to 3.81) have a trend to greater prevalence of poor health. One significant finding is that subjects with family history of cardiovascular disease or cardiovascular risk factors (hypertension, diabetes, hypercholesterolemia) have greater risk of being in poor cardiovascular health as compared to the subjects with no family history of cardiovascular risk (OR: 1.58; 95% CI: 1.10 to 2.28; $p < 0.01$).

DISCUSSION

Traditional cardiovascular epidemiology has focused on prevalence of risk factors for coronary heart disease and stroke. Only recently has the focus shifted to cardiovascular health and its determinants [4,5]. International

TABLE 2. Age-specific prevalence of number of ideal cardiovascular health factors in men and women according to the American Heart Association metric

	20–29 yrs	30–39 yrs	40–49 yrs	50–59 yrs	60–69 yrs	70+ yrs	Chi-Squared for Trend, p Value
Men (n = 3,426)	254	573	915	879	539	266	
All 7	0 (0.0)	1 (0.2)	1 (0.1)	1 (0.1)	0 (0.0)	0 (0.0)	0.529
Any 6	16 (6.3)	21 (3.7)	11 (1.2)	12 (1.3)	3 (0.5)	5 (1.9)	<0.001
Any 5	59 (23.2)	68 (11.8)	60 (6.5)	35 (4.0)	27 (5.0)	21 (7.9)	<0.001
Any 4	143 (56.3)	212 (37.0)	224 (24.5)	173 (19.7)	119 (22.1)	74 (27.8)	<0.001
Any 3	214 (84.2)	392 (68.4)	512 (55.9)	456 (51.9)	279 (51.7)	160 (60.1)	<0.001
Any 2	246 (96.8)	516 (90.0)	760 (83.0)	722 (82.1)	448 (83.1)	230 (86.4)	<0.001
Any 1	253 (99.6)	561 (97.9)	888 (97.0)	855 (97.2)	528 (97.9)	260 (97.7)	0.384
Women (n = 2,772)	205	568	786	638	447	128	
All 7	0 (0.0)	1 (0.1)	1 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)	0.360
Any 6	12 (5.8)	26 (4.6)	9 (1.1)	7 (1.1)	5 (1.1)	2 (1.5)	<0.001
Any 5	56 (27.3)	131 (23.0)	84 (10.7)	36 (5.6)	29 (6.5)	7 (5.4)	<0.001
Any 4	134 (65.3)	286 (50.3)	259 (32.9)	150 (23.5)	85 (19.0)	26 (20.3)	<0.001
Any 3	174 (84.9)	437 (76.9)	492 (62.6)	353 (55.3)	221 (49.4)	69 (53.9)	<0.001
Any 2	202 (98.5)	537 (94.5)	714 (90.8)	539 (84.5)	363 (81.2)	110 (85.9)	<0.001
Any 1	205 (100.0)	566 (99.6)	774 (98.5)	625 (97.9)	437 (97.7)	126 (98.4)	0.003

Values are n or n (%).

studies have reported a low prevalence of cardiovascular health in most developed countries [6–10]. The present study, the first from India, shows a low prevalence of ideal cardiovascular health factors among the urban subjects. Prevalence of physical activity, healthy diet, ideal BMI, and desirable BP and glucose levels are especially low.

The NHANES studies were retrospectively analyzed to describe trends in cardiovascular health factors in the United States [11]. Cardiovascular health status was poor in the 1998 to 1999 study and was similar to the present study. Serial evaluation of NHANES reported a significant improvement in health status; although at the current rate, the U.S. population is unlikely to achieve the Healthy People 2020 target [23]. A poorer cardiovascular health status has been reported from China and only 1.5% of the population is reported in good health, much less than in the present study (Figure 1). Studies from other countries have reported poor cardiovascular health status similar to the present study [9,10,24]. As there are no similar studies from India, our results are not locally comparable. It appears that poor cardiovascular health is a global problem and achievement of ideal health remains an important quest [23].

Cardiovascular health has been defined by the 7-point metric by the AHA [5]. This has been developed for periodic surveillance of cardiovascular health to achieve a target of Healthy People 2020 in the United States [4]. After the U.N. declaration on noncommunicable diseases in 2011 [25], WHO has developed and adopted a 25 × 25 goal for noncommunicable disease risk reduction [26]. This proposes to achieve a 25% reduction in cardiovascular disease mortality by the year 2025 and requires greater focus on cardiovascular disease prevention and good cardiovascular health [27]. Steps to achieve this target include incorporation of noncommunicable diseases in the developmental agenda and a nationwide scale-up, multisectoral action and partnerships, population-wide prevention focusing of noncommunicable diseases, health care and health systems reforms, translational research, policy coherence to maximize synergies, and periodic monitoring [28]. Focus on policy issues, administrative change, public health approaches, and clinical interventions is important to achieve reduction in smoking, salt intake, BP levels, and better coronary heart disease and glycemic control [29]. All these factors are also components of AHA-defined 7-factor matrix. Our study focuses on health factors and periodic studies similar to ours from India are needed to evaluate the reduction in risk to achieve the 25 × 25 goal proposed by WHO.

There are a few limitations of the present study. The study is limited to urban Indian subjects and is limited to middle-class populations and is not representative of rural India and the urban poor. Urban locations are hotbeds of cardiovascular disease epidemic in India [30], and, therefore, the present study is important. We used a cluster-sampling approach in the present study to evaluate populations in a middle-class urban location. The selection

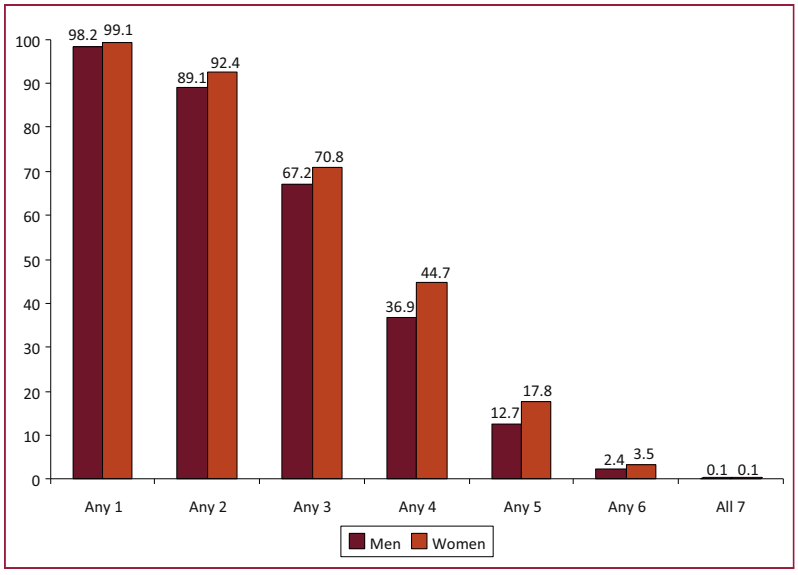

FIGURE 1. Age-adjusted prevalence (%) of number of cardiovascular health factors in men and women.

of middle-class locations is based on a municipal classification that takes into account land cost, housing type, and accessibility to various public amenities within a city and is fairly uniform within the country [21]. It is possible that there are subtle differences in characteristics of the location in various cities due to local factors. We did not adjust the prevalence rates for this heterogeneity. Low response rate (62%) in the study is also a concern and it is possible that those excluded were more or less healthy than the study subjects were; however, these response rates are similar to other population-based studies in India and elsewhere and are within acceptable limits [31]. We did not measure diet according to the AHA-defined matrix where a more comprehensive dietary history is required [5]. Measurement of physical activity by locally validated tool instead of international physical activity questionnaire is another limitation. Other limitations are biases introduced because

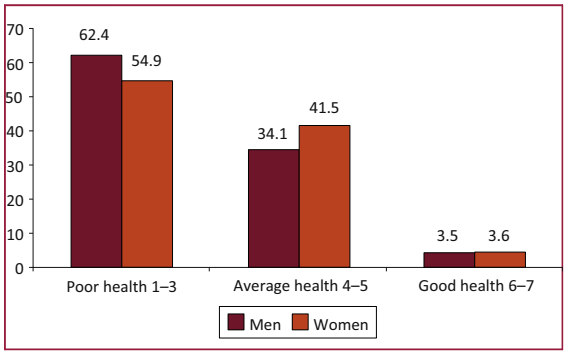

FIGURE 2. Prevalence (%) of poor, average, and good cardiovascular health in men and women.

TABLE 3. Socioeconomic factors and prevalence of good, average, and poor cardiovascular health

	Good CV Health (n = 129)	Average CV Health (n = 1,756)	Poor CV Health (n = 4,193)
Educational status, yrs			
<10	1.0	1.03 (0.64–1.64)	1.04 (0.65–1.64)
11–15	1.0	1.55 (1.08–2.25)*	1.29 (0.90–1.85)
>15	1.0	1.07 (0.98–1.03)	1.47 (0.95–2.27)
Socioeconomic class			
1–3 (high)	1.0	1.58 (0.63–3.94)	1.54 (0.62–3.81)
4–6 middle	1.0	1.03 (0.72–1.48)	1.29 (0.71–1.45)
>6 (lower middle)	1.0	0.93 (0.58–1.49)	1.01 (0.64–1.60)
Family type			
Nuclear	1.0	0.88 (0.61–1.27)	0.84 (0.59–1.21)
Extended	1.0	1.04 (0.59–1.81)	0.89 (0.52–1.55)
Joint	1.0	1.04 (0.73–1.49)	1.07 (0.75–1.51)
Family history of CVD or CVD risk factors	1.0	1.20 (0.83–1.74)	1.58 (1.10–2.28)*

Values are OR or OR (95% CI).
CI, confidence interval; CV, cardiovascular; CVD, cardiovascular disease; OR, odds ratio.
*$p < 0.05$.

of sampling, nonrepresentation of the Indian population, measurement techniques, and failure to correct for regression dilution. However, many of the limitations are inherent in a cross-sectional epidemiological study; therefore, the data are subject to similar biases as discussed earlier [15]. The cluster sampling approach that we used in the present study is open to criticism. This approach focuses on a single location within the larger sampling frame and is subject to selection bias. However, our study was a priori focused on middle-class locations in a particular city, and we tried to include all the subjects within this location. We did not perform systematic stratified random sampling of the eligible study population. This may have led to overrepresentation of individuals within neighborhoods and within families. Moreover, we did not performed data analysis adjusting for cluster effects. Low prevalence of healthy lifestyles in the present study may, therefore, be an overestimate. However, previous studies suggest that lower socioeconomic status groups in India have greater prevalence of unhealthy lifestyles [32]; therefore, the present study results may have underestimated the actual prevalence of healthy lifestyles. This is a major study limitation.

Strengths of the study include nationwide scope of the study, adequate representation of men and women, and study of multiple risk factors using uniform methodology.

CONCLUSIONS

This study shows that the prevalence of ideal cardiovascular health is low in Indian urban subjects. This shows the importance of strategies to improve cardiovascular health, which is a neglected priority. This includes focus on control of smoking and other tobacco products, promotion of healthy diets by subsidizing healthful fruits and green vegetables, and control on unhealthy fats, as well as promotion of physical activity by creation of opportunities to walk and play safely. This would lead to avoidance of obesity and lower population-level BP, cholesterol, and glucose levels. Cardiovascular diseases are rampant in India and kill millions prematurely. Primordial and primary prevention is the best way forward.

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