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Original Article

Cholesterol lipoproteins and prevalence of dyslipidemias in urban Asian Indians: A cross sectional study



Soneil Guptha^a, Rajeev Gupta^{b,*}, Prakash Deedwania^c, Anil Bhansali^d, Anuj Maheshwari^e, Arvind Gupta^f, Balkishan Gupta^g, Banshi Saboo^h, Jitendra Singhⁱ, Vijay Achari^j, Krishna Kumar Sharma^k

^a Jaipur Heart Watch Foundation, Jaipur, India

^b Department of Medicine, Fortis Escorts Hospital, Malviya Nagar, Jawahar Lal Nehru Marg, Jaipur 302017, India

^c Department of Cardiology, University of California San Francisco and VA Hospital, Fresno, CA, USA

^d Department of Endocrinology, Post Graduate Institute of Medical Education and Research, Chandigarh, India

^e Department of Medicine, Babu Banarasi Das College of Dental Sciences, Lucknow, India

^f Jaipur Diabetes Research Centre, Jaipur, India

^g Department of Medicine, Sardar Patel Medical College, Bikaner, India

^h DiaCare and Research, Ahmadabad, India

ⁱ Department of Medicine, Government Medical College, Jammu, India

^j Department of Medicine, Patna Medical College, Patna, India

^k Department of Research, Fortis Escorts Hospital, Jaipur, India

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ABSTRACT

Objective: To determine levels of cholesterol lipoproteins and prevalence of dyslipidemias in urban Asian Indians.

Methods: Population based 6123 subjects (men 3388) were evaluated. Mean±1SD of various cholesterol lipoproteins (total, HDL, LDL and non-HDL cholesterol) and triglycerides were reported. Subjects were classified according to US National Cholesterol Education Program. **Results:** Age-adjusted levels in men and women were cholesterol total 178.4 ± 39 and 184.6 ± 39, HDL 44.9 ± 11 and 51.1 ± 11, LDL 102.5 ± 33 and 106.2 ± 33, total:HDL 4.15 ± 1.2 and 3.79 ± 1.0 and triglycerides 162.5 ± 83 and 143.7 ± 83 mg/dl. Age-adjusted prevalence (%) in men and women, respectively were, total cholesterol ≥200 mg/dl 25.1 and 24.9, LDL cholesterol ≥130 mg/dl 16.3 and 15.1 and ≥100 mg/dl 49.5 and 49.7, HDL cholesterol <40/<50 mg/dl 33.6 and 52.8, total:HDL cholesterol ≥4.5 29.4 and 16.8, and triglycerides ≥150 mg/dl 42.1 and 32.9%. Cholesterol level was significantly greater in subjects with better socioeconomic status, body mass index and waist circumference while triglycerides were more among those with high socioeconomic status, fat intake, body mass index and waist circumference ($p < 0.05$). Hypercholesterolemia awareness (15.6%), treatment (7.2%) and control (4.1%) were low.

Conclusions: Mean cholesterol and LDL cholesterol are low and triglycerides were high in urban Asian Indians. Most prevalent dyslipidemias are borderline high LDL, low HDL and

* Corresponding author.

E-mail addresses: rajeevg@satyam.net.in, rajeevgg@gmail.com (R. Gupta).

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high triglycerides. Subjects with high socioeconomic status, high fat intake and greater adiposity have higher total and LDL cholesterol and triglyceride and lower HDL cholesterol.

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1. Introduction

Lipid abnormalities, such as high total and low density lipoprotein (LDL) cholesterol and low high density lipoprotein (HDL) cholesterol, are the most important cardiovascular risk factors.¹ Prospective epidemiological studies in high and middle income countries in Europe and North America have consistently reported a direct and continuous association of total and LDL cholesterol and inverse association of low HDL cholesterol with coronary heart disease (CHD) morbidity and mortality.^{1–3} Similar results have been reported in prospective studies from Australasia and East Asia.⁴ No prospective studies exist in low-income countries including India.^{5,6} INTERHEART case–control study⁷ in 52 countries, including many low income countries in Asia, Africa and South America, reported significant association of high apolipoprotein B (apoB), total and LDL cholesterol, and total:HDL cholesterol ratio and low apoA1 and HDL cholesterol with incident acute myocardial infarction.⁸

Population-wide levels of various cholesterol lipoproteins (total, LDL and HDL) and triglycerides as well as prevalence of various dyslipidemias have been well reported from high and middle-income countries.^{1,9} The US National Health and Nutrition Evaluation Surveys periodically report population-wide lipid levels.^{10,11} Mean population cholesterol levels were 240 mg/dl in 1960's and have declined to 202 mg/dl by early 2010.^{10,11} Similar data have been reported from many countries in Western Europe and Australasia.¹² The Global Burden of Chronic Diseases Risk Factor study reported mean levels of total cholesterol and determined trends in 180 countries over a 35-year period from 1980 to 2005.¹³ It was observed that total cholesterol levels were high in high and middle income countries at baseline and declined significantly over this period in high income countries and remained unchanged in upper middle income countries. In lower middle and low income countries total cholesterol levels were low and there was an increase over this 35-year period.¹³ Only a few large population based studies to determine mean population cholesterol and cholesterol lipoprotein levels and prevalence of hypercholesterolemia or other lipid abnormalities have been performed in India. Previous studies have been limited to local (a city) or regional (a particular state) levels. The only multisite studies that reported lipid levels and prevalence of various dyslipidemias were Indian Industrial Population Study,¹⁴ and India Migration Study.¹⁵ Multisite Indian Council of Medical Research Integrated Disease Surveillance Project¹⁶ and Indian Women's Health Study¹⁷ reported prevalence of hypercholesterolemia only. We designed the India Heart Watch to evaluate multiple cardiometabolic risk factors in urban populations in India.⁶ Details of rationale and methodology have been reported.^{6,18} The present study

was performed to assess population levels of total cholesterol, LDL cholesterol, non-HDL cholesterol, HDL cholesterol and triglycerides in urban men and women and to assess prevalence of various dyslipidemias. We evaluated lipid abnormalities among the urban middle class because it is the biggest subset of Indian population.^{19,20} This group of apparently homogenous subjects provides unique opportunity to identify influence of lifestyles on cardiometabolic risk factors,^{19,21} including dyslipidemias. Study among this subset of Indian population is also important because this segment of more than 350 million subjects is poorly represented in previous national studies and majority of the Indians shall reside in urban locations by middle of this century.²²

2. Methods

A multisite study to identify prevalence of cardiovascular risk factors in urban populations in India was organized.⁶ Protocol was approved by the institutional ethics committee of the national coordinating center at Jaipur, India. Written informed consent was obtained from all participants. Details of methodology have been reported earlier.¹⁸

2.1. Sampling

Medium sized cities 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. 20 investigators were invited 15 agreed to participate. The cities were in northern (Jammu, Chandigarh, Karnal, Bikaner), western (Ahmadabad, Jaipur), eastern (Lucknow, Patna, Dibrugarh), southern (Madurai, Hyderabad, Belgaum) and central (Indore, Nagpur) regions of India. Four investigators dropped out due to non-availability of technical support and motivation and 11 investigators and their teams finally performed surveys. An accredited national laboratory (www.thyrocare.com) was identified and contracted for collection and processing the blood samples at their national center. Simple cluster sampling was performed at each site. A middle-class location was identified at each city. This depended upon the municipal classification which is based on reserve land price and is periodically developed by local government for taxation purposes. A sample size of about 250 men and 250 women ($n = 500$) at each site is considered adequate by World Health Organization to identify 20% difference in mean level of biophysical and biochemical risk factors.²¹ We invited 800–1000 subjects in each location to ensure participation of at least 500 subjects at each site estimating a response of 70% as reported in previous studies.²³ At each site a uniform procedure for recruitment was followed.

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