Original Articles

Socioeconomic status and dyslipidaemia in a South Indian population: The Chennai Urban Population Study (CUPS 11)

RAJENDRA PRADEEPA, RAJ DEEPA, SUBRAMANIAM SHANTHI RANI, GOPAL PREMALATHA, RAGHAVAN SAROJA, VISWANATHAN MOHAN

ABSTRACT

Background. Socioeconomic differences have been shown to be linked with the prevalence of coronary artery disease (CAD) and its risk factors such as dyslipidaemia based on urban–rural comparisons. However, very little data are available on the prevalence of dyslipidaemia within an urban environment. The aim of this study was to assess the pattern of dyslipidaemia in two different socioeconomic groups within an urban South Indian population.

Methods. The Chennai Urban Population Study is an epidemiological study involving two residential areas in Chennai, South India representing different socioeconomic strata. Of the 1399 eligible subjects (age ³20 years), 1262 (90.2%) participated in the study (Tirumangalam: middle income group, 479 subjects, response rate 91.4%; and T. Nagar: low income group, 783 subjects, response rate 89.4%). A detailed questionnaire on the socioeconomic and clinical background of the subjects was collected. Biochemical investigations included lipid profile and oral glucose tolerance tests. The classification of lipid abnormalities was done according to the National Cholesterol Education Programme–Adult Treatment Panel III [NCEP (ATP III)] guidelines.

Results. The Tirumangalam group (mean monthly income of Rs 8075) represents the middle income group, while the T. Nagar group (mean monthly income of Rs 1399) represents the low income group. The prevalence rates of lipid abnormalities were higher among the middle income group compared to the low income group. The prevalence of high risk cholesterol levels in men was 10.6% (middle income group) *v.* 2.7% (low income group; $p<0.001$) and among women 19.1 *v.* 4.7% ($p<0.001$). Similarly, the prevalence of high risk triglyceride levels in men was 15.7% *v.* 9.3% ($p=0.02$) and among women 10.3% *v.* 7.5% ($p<0.05$); high risk low density lipoprotein (LDL) levels among men was 7.8% *v.* 3.0% ($p=0.01$), and among women 11.2% *v.* 4.5% ($p<0.001$). High density lipoprotein (HDL) cholesterol levels were lower in the low income group but the total cholesterol/HDL cholesterol ratio was higher among men in the middle income group ($p<0.001$) but not among women. Logistic regression analysis revealed that socioeconomic status had a strong association with hypercholesterolaemia and high LDL levels, even after adjusting for age and body mass index.

Conclusion. Socioeconomic factors influence the pattern of dyslipidaemia in this urban South Indian population, with dyslipidaemia being more common and severe in the middle income group.

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Madras Diabetes Research Foundation, 6B, Conran Smith Road, Gopalapuram, Chennai 600086, Tamil Nadu, India
RAJENDRA PRADEEPA, RAJ DEEPA, SUBRAMANIAM SHANTHI RANI, GOPAL PREMALATHA, RAGHAVAN SAROJA, VISWANATHAN MOHAN

Correspondence to VISWANATHAN MOHAN; *mvdsc@vsnl.com*

INTRODUCTION

The prevalence of coronary artery disease (CAD) in India is rising rapidly.[1,2] Reddy and Yusuf[3] have predicted that India would lead the world in the prevalence of CAD in the next 15 years. A 10-fold increase in the prevalence of CAD compared to 40 years ago has been shown recently by us in the Chennai Urban Population Study (CUPS).[4] The Jaipur Heart Watch-2 reported an escalation in coronary risk factors such as truncal obesity, diabetes and dyslipidaemia within a span of 6 years among North Indians.[5] Furthermore, studies which made an attempt to explain this rising prevalence revealed the involvement of fibrinolytic factors and lipoprotein (a) with CAD, and identified clustering of cardiovascular risk factors in native Indians.[6–9]

However, a rapid epidemiological transition with increasing life expectancy and sociological changes of acculturation could be the main reasons for the accelerating CAD epidemic in India.[10] Epidemiological transition determines the socioeconomic gradient associated with the prevalence of CAD.[11,12] Social and economic inequalities have been shown to be associated with health problems in general and non-communicable diseases such as diabetes, hypertension, dyslipidaemia and CAD in particular.[13,14] However, there is seemingly a paradox in the influence of socioeconomic factors between developing and developed countries. In developed countries, individuals belonging to a low income status have higher death rates due to CAD, while in developing countries it is the reverse.[13–17] This paradox is due to different countries being in different stages of epidemiological transition.

The influence of urbanization, acculturation and socioeconomic factors have been compared in urban and rural populations. Greater lipid abnormalities were seen among urban residents compared to their rural counterparts.[18–21] Epidemiological data from other South Asian countries have also confirmed the association of urbanization with CAD.[22,23] However, there is a paucity of data comparing different socioeconomic groups within an urban environment, which earlier studies tended to consider as a uniform group. In reality, there are vast socioeconomic differences within an urban area. We had earlier reported on the higher prevalence of various components of the insulin resis-

tance syndrome (metabolic syndrome) among the middle income group compared to the low income group from the CUPS.[15,24] The intra-urban difference in the prevalence of glucose intolerance was later confirmed by another study from the same city.[25] In this article, we focus on the abnormalities in serum lipids using the new National Cholesterol Education Programme-Adult Treatment Panel III [NCEP (ATP III)] guidelines[26] in two different socioeconomic groups within urban Chennai.

SUBJECTS AND METHODS

The Chennai Urban Population Study (CUPS) is an ongoing project in Chennai, South India. Chennai is the fourth largest city in India and has a population of approximately 6 million. Two residential colonies, one in Tirumangalam representing the middle income group and one in T. Nagar representing the low income group in Chennai city, were selected and all individuals ³20 years of age were invited to participate in the study. Of a total of 1399 individuals available for the study, 1262 (Tirumangalam 479; response rate: 91.4%; and T. Nagar: 783; response rate: 89.4%) subjects participated in the screening programme (overall response rate: 90.1%). The methodological details of the CUPS study and the data on the metabolic syndrome, prevalence of CAD and preclinical markers of atherosclerosis have been published recently.[4,15,24,27–29]

Information on gender, age, anthropometric measurements including weight, height, waist and hip measurements, physical activity, smoking and alcohol intake, were obtained using a standardized questionnaire by a structured interview. The body mass index (BMI) was calculated using the formula weight (kg)/height (m^2). Waist and hip measurements were done using standard techniques [27] and the mean of two measurements was taken for calculating the waist–hip ratio (WHR). Blood pressure was recorded in the sitting position in the right arm to the nearest 2 mmHg with a mercury sphygmomanometer (Diamond Deluxe BP apparatus, Pune, India). Two readings were taken 5 minutes apart and the mean of the two was taken as the blood pressure. The first and fifth Korotkoff's sounds were used to define the systolic and diastolic blood pressure, respectively.

Physical activity level was graded as light, moderate and heavy, based on a physical activity questionnaire, which included job-related and leisure time activities and specific questions on exercise.[4,15] Individuals were classified as non-smokers (if they had never smoked), ex-smokers (if they had smoked uptil 1 year before the survey) and current smokers (habitual smokers regardless of the quantity smoked). Alcohol intake was categorized as none, social (if occasional drinkers) and regular (individuals who admitted to taking alcohol every day regardless of the quantity consumed).

A fasting blood sample was collected for biochemical investigation after an overnight fast of at least 10 hours. Biochemical analyses were done on a Ciba Corning Express Plus Auto Analyser (Corning, Medfield, MA, USA) using kits supplied by Boehringer Mannheim (Mannheim, Germany). Serum cholesterol (CHOD-PAP method) and serum triglycerides (GPO-PAP method) were measured using kits supplied by Boehringer Mannheim, Germany. High density lipoprotein (HDL) cholesterol was estimated by the CHOD-PAP method after precipitating the low density lipoprotein and chylomicron fractions by the addition of phosphotungstic acid in the presence of magnesium ions and very low density lipoprotein (VLDL). Low density lipoprotein (LDL) cholesterol was calculated using the Friedewald formula.[30] LDL cholesterol could not be calculated for 15 subjects who had triglyceride levels >400 mg/dl. Fasting and 2-hour plasma glucose estimations were done by the glucose oxidase method.

A resting 12-lead electrocardiogram (ECG) was done in 1175 subjects (response rate: 84%). Minnesota coding was used to grade the ECGs by a single trained grader (GP) who was blinded to the clinical status of the patient.

Definitions and diagnostic criteria

Lipid abnormalities were classified based on the NCEP (ATP III)[26] guidelines. Diabetes was diagnosed based on the past medical history, drug treatment for diabetes, and/or criteria outlined by the World Health Organization Consultation Group.[31]

Abdominal obesity and obesity was defined using the revised criteria for Asian Indians (obesity: BMI >25 kg/m^2 for both men and women,[32] abdominal obesity: waist circumference ³90 cm for men and ³80 cm for women).[32]

Hypertension was diagnosed if the subjects had a systolic blood pressure of >140 mmHg and/or a diastolic blood pressure of >90 mmHg or any level of blood pressure in subjects taking antihypertensive medications (JNC-V criteria).[33]

Coronary artery disease was diagnosed based on a past history of documented myocardial infarction (MI) and/or ECG changes suggestive of ST segment depression (Minnesota codes 1–1–1 to 1–1–7), and/or Q wave changes (Minnesota codes 4–1 to 4–2), and/or T wave changes (Minnesota codes 5–1 to 5–3). Documented MI was diagnosed if an individual had a positive history of MI in the medical records (a summary report after discharge from a hospital). Medical records were verified wherever possible and drug treatment for CAD (aspirin or nitrates) was also diagnosed as CAD.[4]

Smoking, family history of CAD, hypertension and age have been identified as risk factors that can modify LDL goals by the NCEP. We included socioecomic status (middle income group), obesity, central abdominal obesity and sedentary lifestyle as risk factors for CAD.

Statistical analysis

All the data were computed on a FoxPro database and statistical analyses were done using SPSS PC+ 4.0.1 version (Chicago, IL). Student's *t* tests were used for comparison of means and Chi-square tests and Fisher's exact *t* test for comparison of frequencies. Regression analysis for dyslipidaemia was performed using the NCEP cut-off values for cholesterol, triglycerides, LDL cholesterol and HDL cholesterol as dependent variables, and socioeconomic status, age and BMI as independent variables.

RESULTS

Table I shows the characteristics of the study population. There were 43.8% men in Tirumangalam and 44.3% in T. Nagar. The T. Nagar population was younger ($p<0.001$), had a lower BMI ($p<0.001$), lower systolic ($p<0.001$) and diastolic blood pressure ($p<0.001$), and fasting plasma glucose ($p<0.001$) compared to the Tirumangalam population. However, the prevalence of smoking (T. Nagar 40.4%, Tirumangalam 12.9%, $p<0.001$) and alcohol use (T. Nagar 31.1%, Tirumangalam 11.0%, $p<0.001$) was higher among the T. Nagar population compared to that of Tirumangalam.

The crude prevalence rate of CAD in the middle income group (15.5%) was significantly higher than in the low income group (8.5%; $p=0.003$). However, this significance disappeared when the prevalence rate was age-standardized to the Chennai Census 1991 (9.5% *v.* 8.4%).

In T. Nagar 3.7% were professionals, 9.3% clerks, 48.9% manual labourers and 38.1% housewives and others. In the Tirumangalam population, 24.8% were professionals, 22.5% clerks, 4.4% were manual labourers and 48.2% were housewives and others. The mean monthly income among the T. Nagar group was Rs 1399, which was significantly lower than that in the Tirumangalam group (Rs 8075; p<0.001; Table I). Thus the T. Nagar population represented a low income group while the Tirumangalam population represented a middle income group.

Table II shows the serum lipid values of the study population. The middle income group had significantly higher levels of serum cholesterol (men p<0.001, women p<0.001), LDL cholesterol (men p<0.001, women p<0.001) and serum triglycerides (men p<0.001, women p<0.001). Surprisingly, HDL cholesterol levels were lower in the lower income group despite a higher level of physical activity. However, the total cholesterol/HDL ratio was higher among men in the middle income group (p<0.001) but not among women.

The prevalence of high risk cholesterol levels was significantly higher among the middle income group (men 10.6%, women 19.1%) compared to the low income group (men 2.7%, women 4.7%, p<0.001). Similarly, the prevalence of very high risk triglyceride levels was high among men and women in the middle income group compared to their low income group counterparts (men: 10.1% *v.* 0.6%, p<0.001; women 0.8% *v.* nil).

The prevalence of very high risk LDL cholesterol levels was not significantly different among the study groups. However, the prevalence of high risk LDL cholesterol levels was significantly high among the middle income group compared to the low income group, both among men (p=0.01) and women (p<0.001).

Table III presents the distribution of non-lipid risk factors. All the non-lipid risk factors were significantly higher in subjects with lipid abnormalities (p<0.05) except in subjects with low HDL levels. Current smoking did not have an association with lipid abnormalities. Table IV presents the results of the regression analysis performed using different lipid parameters (based on the NCEP cut-off values) as dependent variables, and socioeconomic status (low income group, reference) as an independent variable. A higher socioeconomic status showed a strong association with high LDL levels (OR: 2.4, p<0.001), high cholesterol levels (OR: 3.3, p<0.001), high triglyceride levels (OR 1.6, p<0.001), low HDL levels (OR: 0.5, p<0.001) and high total cholesterol/HDL ratio (OR: 1.5, p=0.002).

Multiple logistic regression analysis showed that even after adjusting for other variables such as age and BMI, a higher socioeconomic status showed a significant association with hypercholesterolaemia (OR: 2.1, p<0.001) and high LDL levels (OR: 1.3, p<0.049).

TABLE I. Characteristics of the study population

Parameters	Tirumangalam (*n*=479)	T. Nagar (*n*=783)	p value
Men (%)	43.8	44.3	–
Age (years)			
Mean (SD)	49 (14)	39 (15)	p<0.001
Median	46	36	
25th percentile	39	27	
75th percentile	57	48	
Body mass index (kg/m²)			
Mean (SD)	24.34 (4.02)	21.47 (4.34)	p<0.001
Median	23.95	20.96	
25th percentile	21.62	18.13	
75th percentile	26.78	24.01	
Waist circumference (cm)			
Mean (SD)	84.0 (11.1)	72.1 (12.8)	p<0.001
Median	84.0	72.0	
25th percentile	76.5	64.2	
75th percentile	91.4	80.0	
Waist–hip ratio			
Mean (SD)	0.88 (0.09)	0.83 (0.08)	p<0.001
Median	0.88	0.82	
25th percentile	0.81	0.77	
75th percentile	0.95	0.88	
Systolic blood pressure (mmHg)			
Mean (SD)	126 (15)	120 (16)	p<0.001
Median	125	120	
25th percentile	115	110	
75th percentile	135	130	
Diastolic blood pressure (mmHg)			
Mean (SD)	81 (10)	78 (10)	p<0.001
Median	80	80	
25th percentile	75	70	
75th percentile	85	80	
Fasting plasma glucose (mg/dl)			
Mean (SD)	96 (52)	79 (36)	p < 0.001
Median	88	73	
25th percentile	75	64	
75th percentile	99	83	
Income (Rs)			
Mean (SD)	8075 (3859)	1399 (916)	p<0.001
Median	8000	1000	
25th percentile	2500	600	
75th percentile	13500	1400	

DISCUSSION

Strikingly high rates of CAD have been reported among migrant South Asians compared to other ethnic populations.[34–39] The prevalence of the metabolic syndrome [characterized by central obesity, impaired glucose tolerance, diabetes and abnormal lipid profile (comprising low levels of HDL and high levels of triglycerides)] is also high and this may at least partially explain the high prevalence of CAD among Asian Indians.[39] While the metabolic syndrome itself is a consequence of an altered lifestyle and urbanization, earlier studies in China,[18] Japan[19] and Saudi Arabia[20] have shown an abnormal lipid pattern among urban residents compared to rural residents. Similarly, studies from India on urban–rural comparisons have revealed a high prevalence of hypercholesterolemia,[14] while a reverse association was noted with low HDL levels. Though these studies highlight the effect of urbanization on lipid profile, very little is known about the effect of socioeconomic factors on the lipid profile within an urban environment. This is important in view of the large differences in socioeconomic status of people living within an urban environment in developing countries.

In the present study, the prevalence of hypercholesterolaemia, hypertriglyceridaemia and elevated LDL cholesterol was observed to be higher in the middle income group compared to the low income group. However, the prevalence of low HDL cholesterol levels was higher among the low income group in spite of more physical activity. This could probably be due to the lower cholesterol levels observed in this group. It could also be due to the higher smoking rates which are associated with low HDL levels.[40] However, the total cholesterol to HDL ratio was lower among the low income group compared to the middle income group, indicating that the lower socioeconomic group possesses a lower risk for CAD in terms of dyslipidaemia.

The lower prevalence of dyslipidaemia among the low income

TABLE II. Serum lipid levels and lipid abnormalities in the study population

Classification	Men			Women		
	Tirumangalam (*n*=210)	T. Nagar (*n*=347)	p value	Tirumangalam (*n*=269)	T. Nagar (*n*=436)	p value
Total cholesterol						
Mean (SD)	189 (39)	156 (35)	<0.001	190 (41)	171 (37)	<0.001
Age-adjusted mean (SD)	196 (46)	150 (42)	<0.001	196 (50)	169 (46)	<0.001
Desirable (%)	62.1	89.0	<0.001	63.0	80.6	<0.001
Borderline high risk (%)	27.3	8.4	<0.001	25.2	14.8	<0.001
High risk(%)	10.6	2.7	<0.001	19.1	4.7	<0.001
Serum triglycerides						
Mean (SD)	143 (85)	117 (83)	<0.001	125 (76)	109 (57)	<0.001
Age-adjusted mean (SD)	150 (80)	115 (80)	<0.001	129 (80)	106 (62)	<0.001
Desirable (%)	65.2	78.1	<0.001	76	83.4	0.01
Borderline high risk (%)	18.2	12	0.05	13	9.1	NS
High risk (%)	15.7	9.3	0.02	10.3	7.5	NS
Very high risk (%)	10.1	0.6	<0.001	0.8	0	–
LDL cholesterol						
Mean (SD)	118 (39)	97 (31)	<0.001	120 (38)	109 (32)	<0.001
Age-adjusted mean (SD)	127 (35)	92 (35)	<0.001	127 (42)	108 (35)	<0.001
Desirable (%)	26.6	55.8	<0.001	26.6	41.4	<0.001
Near or above optimal (%)	34.8	31.5	NS	37.8	33.6	NS
Borderline high risk (%)	27.1	9.1	<0.001	20.5	19.3	NS
High risk (%)	7.8	3.0	0.010	11.2	4.5	<0.001
Very high risk (%)	3.6	0.6	0.14	3.9	1.6	NS
HDL cholesterol						
Mean (SD)	38 (8)	36 (8)	0.004	44 (11)	40 (10)	<0.001
Age-adjusted mean (SD)	38 (8)	35 (8)	<0.001	46 (12)	38 (12)	<0.001
High risk (%)	57.6	75.7	<0.001	69.5	83.7	<0.001
Borderline high risk (%)	40.4	21.6	<0.001	23.0	13.1	0.006
Desirable (%)	2.0	2.7	NS	7.5	3.2	0.010
Total cholesterol/HDL ratio						
Mean (SD)	5.1 (1.3)	4.6 (1.3)	<0.001	4.5 (1.4)	4.5 (1.2)	<0.001
Age-adjusted mean (SD)	5.2 (1.4)	4.5 (1.3)	<0.001	4.6 (1.5)	5.2 (1.4)	<0.001

Total cholesterol: desirable <200 mg/dl; borderline high risk 200–239 mg/dl; high risk ³240 mg/dl
Serum triglyceride: desirable <150 mg/dl; borderline high-risk 150–199 mg/dl; high risk 200–499 mg/dl; very high risk ³500 mg/dl
LDL cholesterol: desirable <130 mg/dl; near or above optimal 100–129 mg/dl; borderline high risk 130–159 mg/dl; high risk 160–189 mg/dl; very high risk ³190 mg/dl
HDL cholesterol: *Men* desirable ³60 mg/dl; borderline high risk 40–59 mg/dl; high risk <40 mg/dl
Women desirable ³70 mg/dl; borderline high risk 50–69 mg/dl; high risk <50 mg/dl
ns not significant

TABLE III. Association of non-lipid factors with lipid abnormalities

Parameters	Total cholesterol		Serum triglycerides		HDL cholesterol		LDL cholesterol	
	Normal	Risk group	Normal	Risk group	Normal	Risk group	Normal	Risk group
Socioeconomic status								
Middle income group	31.0	58.9*	34.7	47.8*	76.3	32.7*	26.1	45.6*
Age (years)								
Men ³45	25.0	47.1*	27.7	39.9*	59.1	27.0*	20.6	37.2*
Women ³55								
Body mass index ³25 kg/m^2	24.8	37.0*	23.2	42.8*	36.7	28.6†	18.8	33.8*
Waist circumference (cm)								
Men ³90	24.3	47.3*	24.2	48.9*	36.3	31.6	19.0	37.2*
Women ³80								
Blood pressure (mmHg)								
Systolic ³140 or diastolic ³90 or known hypertension	16.0	34.9*	18.5	27.5*	40.0	18.2*	12.9	25.8*
Current smoking	14.8	8.9†	12.7	15.6	19.1	13.5‡	18.0	10.2 *
Diabetes	8.8	21.9*	7.9	25.7*	16.7	12.1	4.2	16.3*
Light sedentary lifestyle	40.7	56.9*	43.1	49.6‡	78.6	41.4	35.6	50.7*
Family history (parents) of CAD	11.3	16.1‡	12.2	13.4	20.5	11.9*	9.3	14.6‡

Total cholesterol: Risk group ³200 mg/dl Serum triglyceride: Risk group ³150mg/dl
LDL cholesterol: Risk group ³100 mg/dl HDL cholesterol: Risk group men <40 mg/dl; women <50 mg/dl
*p<0.001 compared to normals, †p<0.01 compared to normals, ‡p<0.5 compared to normals

TABLE IV. Association of higher socioeconomic status with dyslipidaemia

Parameters	Unadjusted			Adjusted for age and body mass index		
	OR	95% CI	p value	OR	95% CI	p value
Hypercholesterolaemia						
Serum cholesterol (≥200 mg/dl)	3.2	2.4–4.2	<0.001	2.0	1.5–2.7	<0.001
Hypertriglyceridaemia						
Serum triglycerides (≥150 mg/dl)	1.7	1.3–2.3	<0.001	1.1	0.8–1.5	0.453
High LDL cholesterol						
(≥100 mg/dl)	2.4	1.9–3.0	<0.001	1.3	1.0–1.7	0.049
Low HDL cholesterol						
(Men <40 mg/dl; Women <50 mg/dl)	0.6	0.3–1.0	0.056	0.5	0.3–1.0	0.062
Total cholesterol/HDL ratio						
(≥5.0)	1.4	1.1–1.8	0.004	0.9	0.6–1.1	0.258

group could also be attributed to the younger age of these subjects. However, even after age adjustment, except for HDL cholesterol, all the lipid levels were significantly higher among the middle income group. This group showed a strong association with hypercholesterolaemia and high LDL cholesterol levels even after adjusting for age and BMI in the regression model.

Serum cholesterol and CAD have been shown to have a consistent and strong relationship.[41] Additionally, a large number of clinical trials have provided indisputable evidence that lowering cholesterol levels decreases CAD events.[42] Mean serum cholesterol levels >200 mg/dl have been shown to be a risk factor for CAD.[43] Values at or above this level have been reported in urban groups of high socioeconomic status in various studies.[44] However, not much is known about lipid levels among the low income group. In our study the 75th percentile of serum cholesterol among the middle income group was 212 mg/dl for men and 214 mg/dl for women. This is much higher than that in the low income group (men 175 mg/dl, women 192 mg/dl).

Several studies have reported a strong association of CAD with serum triglycerides[45] while others have not.[46] In our study, the 75th percentile of triglycerides among the middle income group was higher than in the low income group. There was also a significant difference in the prevalence of high risk triglyceride levels between the two socioeconomic groups.

The prevalence of non-lipid risk factors was significantly higher among subjects with lipid abnormalities as compared to normolipidaemic subjects (Table III). Obesity has been shown to be more pronounced among urban residents and high income rural residents.[47] Studies have shown obesity to be associated with high triglycerides and reduced HDL cholesterol levels.[48] Waist circumference (a measure of central obesity), as defined by Asian guidelines,[32] showed a strong association with dyslipidaemia (Table III). This corrborates an earlier case–control study in native Indians which showed abdominal obesity to be a predictor of MI.[49] The waist circumference and WHR were significantly higher among the middle income group compared to the low income group (Table I). Other non-lipid risk factors such as diabetes, sedentary lifestyle and BMI also showed a strong association with lipid abnormalities. In addition, the presence of a family history of CAD was also higher among subjects with lipid abnormalities, suggesting the possibility of heritability of cardiovascular risk factors.

The National Nutrition Monitoring Bureau data on the average intake of fat in different socioeconomic groups clearly indicated a rise in the consumption of fats and oils with rise in income.[50] Gupta *et al.*[51] reported that subjects in the upper income group consume a defective cardioprotective diet compared to the low income group. This probably reflects the demographic and economic transition that many developing countries are undergoing, leading to lifestyle changes that predispose to CAD. Decreased physical activity associated with a higher prevalence of obesity, hypertension and diabetes could be the major determinants for the higher prevalence of lipid abnormalities observed in the middle income group. In migrant Indians, socioeconomic factors influence the nutritional intake.[52] Earlier studies on a North Indian urban population also revealed upper social class to be associated with CAD, hypercholesterolaemia and hypertension.[53]

In summary, socioeconomic factors and demographic transition appear to influence the pattern of dyslipidaemia among this urban south Indian population. This underscores the need for planning a programme to prevent the epidemic of CAD in India, especially targeted at the middle income group.

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