Research Article

Prevalence of Dyslipidemia and Its Determinants in Rural Delhi

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Abstract

Introduction: Dyslipidemia is a known risk factor for cardiovascular diseases. For planning future strategies and approaches for prevention of cardiovascular diseases, it is essential to know the burden of dyslipidemia in the community.

Objective: To find prevalence of dyslipidemia and its associated factors in a rural area of Delhi, India.

Materials and Methods: It was a community-based cross-sectional study conducted in two rural areas in Delhi among 1005 subjects, selected using systematic random sampling method. WHO STEPS approach was used to collect data. Blood pressure, body mass index, blood sugar and lipid profile were measured. Data analysis was done using SPSS version 16. Odds of dyslipidemia among subjects with risk factors were calculated. P value less than 0.05 was considered significant.

Results: The overall prevalence of hypercholesterolemia, raised triglycerides and reduced HDL was 31.2%, 21.8% and 95.7% respectively. Dyslipidemia was significantly higher in individuals more than 35 years than less than 35 years and among males. It was significantly higher in those who take alcohol, among overweight/obese and in subjects with diabetes mellitus Type 2. In multivariate analysis, age, occupation, tobacco use, BMI and diabetes mellitus Type 2 were independently associated with dyslipidemia.

Conclusion: There is significant burden of dyslipidemia in rural areas in Delhi. Age, occupation, tobacco use, BMI and diabetes mellitus Type 2 were independent risk factors of dyslipidemia.

Keywords: Lipids, Risk factors, Rural Delhi

Introduction

Non-communicable diseases (NCDs) are leading cause of mortality worldwide. As per reports, between 1990 and 2013, numbers of deaths from non-communicable diseases have increased by 42%. The number of deaths due to cardiovascular diseases (CVDs) showed a significant rise over the same time period by 40%.[1] It is expected that India alone will be burdened with approximately 25% of cardiovascular-related deaths. About more than 50% of the total number of patients with heart diseases will be Indians within the next 10 years.[2] The situation becomes critical with the fact that majority of victims of CVDs in India are in productive years of their lives.[3] Thus prevention of CVDs is an urgent need of today.

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Lipids have a close relationship with CVDs. There is a strong relationship of total cholesterol levels with CVD risk with it being considered as a useful marker of predicting CVDs. Up to 14% and 15%, respectively, of coronary artery disease mortality and ischemic disease mortality is attributable to high total cholesterol (TC). The same is true with increased triglycerides (TGs) also. Increased levels of high density lipoprotein cholesterol (HDL-C) levels are inversely associated with atherosclerosis. Increase in HDL levels is now an accepted therapeutic strategy for decreasing CHD incidence rate.[4,5]

Thus lipid abnormality is an independent risk factor for CVDs. Based on the above-mentioned data, it can be concluded that the decline of the CVDs will not be possible without modifying the serum lipid levels. Evidence suggests about higher prevalence of lipid abnormalities among Asians compared with non-Asians.[6] The prevalence of dyslipidemias varies according to the ethnic, socioeconomic, and cultural characteristics of distinct population groups.[7]

For planning future strategies and approaches for prevention of CVDs, it is essential to know the burden of its risk factors especially dyslipidemia. A major limitation in this effort is lack of population-based data in rural areas in Delhi which are undergoing urbanization at a faster pace. Changing lifestyle and socio-demographic factors may play a role in occurrence of dyslipidemia in rural areas too. With the same context, this article presents results of a research study conducted with the objective to find prevalence of dyslipidemia and its associated factors in rural areas of Delhi, India.

Materials and Methods

Study Design, Setting and Sample Size

A community-based cross-sectional study was conducted in two rural areas in Delhi. Study population was constituted by all people above 18 years of age residing in two villages of Delhi. The sample size was calculated on the basis of a previous study, which recorded prevalence of hypercholesterolemia as 34%.[8] Taking 95% confidence interval and 10% acceptable error, the required sample size came out to be 769. However, a total of 1005 subjects were included in the study. Systematic random sampling was used to select study subjects in the two villages.

Study Instruments and Data Collection

A pre-designed, pre-tested, semi-structured questionnaire was used containing items to assess socio-demographic profile like age, sex, identification data, socio-economic status, etc. The WHO STEPS approach was employed to study the profile of the lipid disorders in the population. STEPS approach includes three sequential phases: collection of information on socio-demographic variables, and behavioral risk factors, that is, tobacco use, alcohol use and related factors using a questionnaire (STEP 1); obtaining clinical measurements such as weight, height, and blood pressure using standardized protocols and instruments (STEP 2); measuring cholesterol, triglycerides and high-density lipoprotein (HDL) (STEP 3).[9] The standard WHO STEPS questionnaire was pretested before the study. It was adapted by including local terms and translated into local (Hindi) language and translated back in English by Hindi and English experts and field tested. Self-reported history of use of tobacco as *bidi* or cigarette or any other form of tobacco, alcohol consumption as well as history of hypertension and diabetes mellitus was obtained from the respondents.

Blood pressure was recorded three times in sitting position, in the right arm, using a standard android dial BP apparatus (Mercury type of BP apparatus is phased out from health care setting in Delhi). The standard protocol was followed in blood pressure recording and analysis. Hypertension was defined as systolic blood pressure (SBP) equal to or more than 140 mmHg and or diastolic blood pressure (DBP) equal to or more than 90 mmHg or those being treated for hypertension.[9,10]

Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared. Overweight and obesity were defined as BMI ≥23–24.9 kg/m^2 and BMI ≥25 kg/m^2 respectively.[11] Blood sugar fasting and post prandial and cholesterol levels were measured among study subjects. Lipid disorders were classified as per National Cholesterol Education Programme (NCEP) guidelines. Hypercholesterolemia was diagnosed with serum cholesterol levels ≥200 mg/dL (≥5.2 mmol/L). Hypertriglyceridemia was taken with serum triglyceride levels ≥150 mg/dL (≥1.7 mmol/L) and reduced HDL cholesterol was considered with HDL cholesterol levels <40 mg/dL (<1.04 mmol/L) for men and <50 mg/dL (<1.3 mmol/L) for women.[12]

Ethical Issues

Each selected subject was explained about the procedure and objectives of the study. Written informed consent was obtained and referral services were provided, if required, at the rural health center. Prior ethical clearance for the study was obtained from the institutional ethics committee.

Statistical Analysis

Data analysis was done using SPSS version 16. The results were explained in simple proportion. Difference between groups was assessed using Chi-square test for their statistical significance. Odds were calculated in logistic regression analysis. P value less than 0.05 was considered significant.

Results

The overall prevalence of hypercholesterolemia, raised triglycerides and reduced HDL was 31.2%, 21.8% and 95.7% respectively among study subjects. Table 1 shows the socio-demographic characteristics such as age, sex, education, occupation and religion of study subjects. The burden of raised TGs was significantly higher among males than females ($p<0.05$). There was significant difference in prevalence of hypercholesterolemia and raised TGs in individuals more than 35 years than less than 35 years ($p<0.05$). There was no significant difference in raised cholesterol, raised TGs and reduced HDL levels with respect to education and religion ($p>0.05$). There was significant difference in various categories of monthly per capita income with cholesterol levels where the proportion of hypercholesterolemia increased with increase in monthly per capita income ($p<0.05$). Likewise significant difference was seen in occupation categories in hypercholesterolemia and raised TGs as well ($p<0.05$). There was no significant difference found in socio-demographic factors with reduced HDL levels ($p>0.05$).

Table 1.Socio-demographic Determinants of Dyslipidemia among Study Subjects

Variable	Sub-Groups	Raised Total Cholesterol	Raised Triglycerides (TGs)	Reduced HDL
Gender	Male (N=391)	125 (32.0)	104 (26.9)*	584 (95.1)
	Female (N=614)	189 (30.8)	116 (19.0)	378 (96.7)
Age	Less than 35 years (N=449)	89 (19.8)*	57 (12.7%)*	426 (94.9)
	More than 35 years (N=556)	225 (40.5)	163 (29.6%)	536 (96.4)
Religion	Hindu (N=980)	309 (31.5)	214 (22.0)	937 (95.6)
	Others (N=25)	5 (16.8)	6 (20.9)	25 (100.0)
Education Level	Primary (N=21)	8 (38.1)	7 (33.3)	20 (95.2)
	Middle (N=205)	59 (28.8)	44 (21.7)	200 (97.6)
	High School (N=247)	68 (27.5)	57 (23.2)	229 (92.7)
	Junior college (N=167)	57 (34.1)	35 (21.2)	162 (97.0)
	Graduate (N=114)	39 (34.2)	16 (14.2)	110 (96.5)
	Post-Graduate (N=40)	11 (27.5)	8 (20)	38 (95.0)
	Illiterate (N=211)	72 (34.1)	53 (25.2)	203 (96.2)
Monthly per capita income	Up to Rs.1000 (N=367)	96 (26.2)*	79 (21.6)	348 (94.8)
	Between Rs. 1001 to Rs. 2000 (N=263)	80 (30.4)	60 (22.9)	253 (96.2)
	Between Rs. 2001 to Rs. 5000 (N=291)	106 (36.4)	64 (22.2)	277 (95.2)
	More than Rs. 5001 (N=84)	32 (38.1)	17 (20.5)	84 (100.0)
Occupation	Professional (N=66)	14 (21.2)*	7 (10.6)*	64 (97.0)
	Semi-Professional (N=19)	10 (52.6)	9 (47.4)	17 (89.5)
	Clerical, Shop-owners, Farm owners (N=24)	9 (37.5)	11 (50.0)	24 (100.0)
	Skilled worker (N=36)	9 (25.0)	15 (41.7)	36 (100.0)
	Semi-skilled worker (N=64)	13 (20.3)	12 (18.8)	62 (96.9)
	Unskilled worker (N=146)	47 (32.2)	43 (29.9)	144 (98.6)
	Housewife (N=488)	158 (32.4)	99 (20.4)	464 (95.1)
	Retired (N=17)	10 (58.8)	7 (41.2)	16 (94.1)
	Unemployed (N=145)	44 (30.3)	17 (11.7)	135 (93.1)

*p value <0.05

Note: All figure are expressed as number (%) row wise

Table 2 shows risk factors of lipid disorders. It can be seen that there was no significant difference in past tobacco use in any disorder (p>0.05). Raised TGs was significantly higher in those with present tobacco use, with alcohol use ever and in the past one year (p<0.05).

Proportion of hypercholesterolemia and raised TGs was significantly higher among patients of diabetes mellitus Type 2 (p<0.05). The same was true with hypertension patients (p<0.05). Significantly higher proportion of overweight and obese were found to have hypercholesterolemia and raised TGs as compared to normal and underweight subjects (p<0.05). No association of any lipid disorder was found with physical activity levels (p>0.05). The prevalence of hypercholesterolemia was significantly higher (34.6%) among those who used saturated fat as cooking media as compared to 28.3% among those who used unsaturated fats. It was highest (38.6%) among those who reported mixed use of fats as cooking media (p>0.05).

Table 2.Risk Factors of Dyslipidemia among Study Subjects

Risk Factors	Sub-groups	Raised Cholesterol	Raised Triglycerides	Reduced HDL
Present tobacco use	Yes (N=112)	43 (38.4)	40 (35.7)*	111 (99.1)
	No (N=893)	271 (30.3)	180 (20.1)	851 (95.3)
Past tobacco use	Yes (N=4)	2 (50.0)	2 (50.0%)	4 (100.0)
	No (N=1001)	312 (31.2)	218 (21.9%)	958 (95.7)
Alcohol use ever	Yes (N=61)	18 (29.5)	18 (29.5)*	59 (96.7)
	No (N=944)	296 (31.4)	202 (21.4)	903 (95.8)
Alcohol use in past one year	Yes (N=48)	15 (31.2)	16 (33.3)*	47 (97.9)
	No (N=957)	299 (31.2)	204 (21.3)	915 (95.6)
Diabetes Mellitus type 2	Yes (N=46)	23 (50.0)*	22 (51.2)*	45 (97.8)
	No (N=959)	291 (30.3)	198 (20.7)	917 (95.6)
Hypertension	Yes (N=142)	65 (45.8)*	44 (31.2)*	138 (97.2)
	No (N=863)	249 (28.9)	176 (20.5)	824 (95.5)
Body mass index	Underweight (N=104)	16 (15.4)*	12 (11.5)*	99 (95.2)
	Normal (N=305)	76 (24.9)	34 (11.2)	288 (94.4)
	Overweight (N=159)	53 (33.3)	41 (26.1)	154 (96.9)
	Obese (N=437)	169 (38.7)	133 (30.6)	421 (96.3)
Brisk walk or cycling daily for 30 minutes	Yes (N=809)	247 (30.5)	183 (22.6)	779 (96.3)
	No (N=196)	67 (34.2)	37 (18.8)	183 (93.4)
Type of cooking oil used	Saturated (N=107)	37 (34.6)*	30 (28.0)	103 (96.3)
	Unsaturated (N=674)	191 (28.3)	143 (21.2)	644 (95.5)
	Mixed (N=224)	86 (38.6)	47 (54.6)	214 (95.5)

*p value <0.05
Note: All figure are expressed as number (%) row wise

Table 3 shows results of multivariate analysis for lipid disorders and risk factors. All those variables with p value $\leq$0.10 in univariate analysis were put into multivariate analysis. For hypercholesterolemia; age, religion, monthly per capita income, occupation, present tobacco use, type of cooking oil used, hypertension, diabetes mellitus Type 2 and BMI were used as independent variables.

For raised TGs, gender, age, occupation, present tobacco use, alcohol use (ever and past one year), hypertension, diabetes mellitus Type 2 and BMI were taken as independent variables.

Since most of independent variables were not associated with HDL levels, only tobacco use (present and past) and physical activity were used as independent variables.

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Table 3.Multivariate Analysis for Risk Factors of Dyslipidemia

Variable	Sub-groups	Odds ratio (95% Confidence Interval)		
		Raised cholesterol	Raised Triglycerides	Reduced HDL
Gender	Female	-	Reference	-
	Male	-	1.30 (0.69–2.44)	-
Age	Less than 35 years	Reference	Reference	–
	More than 35 years	2.17 (1.57–2.99)*	2.05 (1.41–2.98)*	–
Religion	Hindu	Reference	–	–
	Others	0.72 (0.23–2.28)	–	–
Monthly per capita income	up to Rs.1000	Reference	–	–
	Between Rs.1001 to Rs.2000	1.05 (0.72–1.52)	–	–
	Between Rs.2001 to Rs.5000	1.36 (0.95–1.96)	–	–
	More than Rs.5001	1.69 (0.96–2.98)	–	–
Occupation	Unemployed	Reference	Reference	–
	Retired	1.35 (0.46–3.96)	2.35 (0.72–7.53)	–
	Housewife	0.75 (0.48–1.18)	1.48 (0.69–3.14)	–
	Unskilled worker	0.75 (0.49–3.48)	2.05 (1.06–3.99)*	–
	Semi–skilled worker	0.53 (0.25–1.15)	1.74 (0.74–4.09)	–
	Skilled worker	0.55 (0.23–1.34)	3.57 (1.46–8.74)*	–
	Clerical, Shop–owners, Farm owners	0.97 (0.37–2.59)	4.86 (1.67–14.14)*	–
	Semi–Professional	1.41 (0.51–3.93)	4.21 (1.37–12.88)*	–
	Professional	0.37 (0.17–0.79)*	0.70 (0.26–1.86)	–
Present tobacco use	No	Reference	Reference	Reference
	Yes	1.31 (0.82–2.09)	1.88 (1.12–3.45)*	5.18 (0.70–38.21)
Past tobacco use	No	–	–	Reference
	Yes	–	–	1.98 (0.56–3.99)
Alcohol use ever	No	–	Reference	–
	Yes	–	0.75 (0.15–3.74)	–
Alcohol use in past one year	No	–	Reference	–
	Yes	–	1.17 (0.20–6.67)	–
Type of cooking oil used	Saturated	Reference	–	–
	Unsaturated	0.98 (0.61–1.57)	–	–
	Mixed	1.40 (0.83–2.89)	–	–
Brisk walk or cycling daily for 30 minutes	Yes	–	–	Reference
	No	–	–	0.56 (0.28–1.10)
Hypertension	No	Reference	Reference	–
	Yes	1.38 (0.93–2.04)	1.23 (0.80–1.90)	–
Body Mass Index	Underweight	Reference	Reference	–
	Normal	1.84 (0.99–3.42)	0.95 (0.45–1.99)	–
	Overweight	2.30 (1.19–4.45)*	2.23 (1.06–4.68)*	–
	Obese	2.75 (1.50–5.02)*	2.96 (1.50–5.84)*	–
Diabetes Mellitus	No	Reference	Reference	–
	Yes	1.41 (0.74–2.65)	2.42 (1.24–4.76)*	–

*p value <0.05

For hypercholesterolemia, age more than 35 years, occupation and BMI were having independent association. Age more than 35 years and overweight and obesity were having higher odds of hypercholesterolemia. Taking unemployed as reference, professional occupation had lesser odds of hypercholesterolemia. Age, occupation, present tobacco use, BMI and diabetes mellitus Type 2 were independent risk factors of raised TGs levels. Age more than 35 years, present tobacco use, having diabetes mellitus Type 2 and being overweight and obese were having higher odds of raised TGs. No independent association was seen with reduced HDL levels with any one of variable entered in analysis.

Discussion

The present study showed that overall prevalence of dyslipidemias was high among study population. The findings were similar to those reported by Sharma et al.[8] where 34% study subjects had increased total cholesterol levels, 40% had increased triglyceride levels, and 42% had low high-density lipoprotein levels. The prevalence of reduced HDL was very high in the present study. Possible reasons for the same could be pattern and level of urbanization in the area and some other hidden factors which need to be studied. Nevertheless, this confirms the fact that low HDL levels are most common lipid abnormality in India as suggested by ICMR–INDIAB study also.[13] The prevalence of raised total cholesterol and TGs was higher among males than females and among those with higher age. This is consistent with the findings reported by other authors where age and male sex were significantly associated with dyslipidemia.[14,15]

It was observed that with increase in monthly per capita income, the proportion of hypercholesterolemia also increased which shows that income is a determinant of the same. Same has been mentioned by Yu et al. in their study in which higher annual income was associated with increased risk of dyslipidemia.[16] Similarly, occupation classes were also significantly associated with dyslipidemia. The above-mentioned non-modifiable factors play an important role in dyslipidemia. Their role as a causative factor in the pathogenesis of dyslipidemia needs to be studied in detail using appropriate study designs.

Among modifiable risk factors, present tobacco use and alcohol intake was found to be associated with increased TG levels. This was similar to that reported by another study conducted in Turkey where cigarette use and alcohol consumption were positively associated with dyslipidemia.[17] Diabetes mellitus Type 2, hypertension and higher body mass index also had increased burden of dyslipidemia as stated by Cabrera et al. This again points towards need for promoting lifestyle interventions for maintaining weight and blood pressure.[18] Use of saturated fat and mixed type of fats was associated with increased burden of dyslipidemia. This is one of the socio-cultural factors responsible for increase in burden of CVDs in India. With better purchasing power, Indians are increasingly consuming diets high in saturated fats, cholesterol, and refined carbohydrates and low in polyunsaturated fatty acids and fiber which is an issue of concern.[19] In multivariate analysis, higher age, occupation, tobacco use, diabetes and high BMI were independent associated factors for dyslipidemia. This is similar to findings revealed by another study conducted by other authors as well.[14,20]

Conclusion and Recommendation

The present study showed significant burden of dyslipidemia in rural area of Delhi. Age, gender, occupation, income, tobacco use, alcohol intake, high BMI, use of saturated fats in cooking, diabetes and hypertension were determinants of dyslipdemia. It is recommended that urgent efforts are required to be taken to reduce the burden of dyslipidemia. Health care providers should be made aware of these determinants of dyslipidemia so that they can screen the high risk individuals.

Conflict of Interest: Nil

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