International Journal of Medical and Clinical Research
ISSN: 0976-5530 & E-ISSN: 0976-5549, Volume 6, Issue 1, 2015, pp.-321-325.
Available online at http://www.bioinfopublication.org/jouarchive.php?opt=&jouid=BPJ0000232

PREVALENCE OF DYSLIPIDEMIA AMONG ADULTS ATTENDING PREVENTIVE HEALTH CHECKUP PROGRAM OF A TERTIARY CARE HOSPITAL IN RURAL GUJARAT

KARNA S.K.*, THANVI S.S., DAS N. AND PATEL U.B.
P.S. Medical College and Shree Krishna Hospital, Karamsad - 388 325, Gujarat, India.
*Corresponding Author: Email- karna_sunil@hotmail.com

Received: April 14, 2015; Revised: May 21, 2015; Accepted: May 25, 2015

Abstract- *Background*: Hypercholesterolemia is an important coronary risk factor. Few studies from western India have reported prevalence of hypercholesterolemia, particularly in preventive health checkup program. *Objective*: To determine prevalence of dyslipidemia in apparently healthy adults attending preventive health checkup program in rural Gujarat. *Methods*: From medical record database of the hospital, data of 1050 Individuals who were not known case of coronary artery disease and was undergoing preventive health checkup program were taken for analysis. Health records and cholesterol levels were recorded and analyzed based on NCEP -ATP III cut offs. Total cholesterol >200 mg/dl, HDL-C <40 mg/dl, LDLC >130 mg % and TG >150 mg% were defined as abnormal as per NCEP-ATP III criteria. *Results*: The mean values (+SD) of lipid abnormality in studied population were TC= 190+40 mg/dl, LDL= 108+32.6 mg/dl, HDL =49+14.6 mg/dl, TG 124+67.6 mg/dl. Mean TC: HDL ratio was 3.96+0.97 and mean LDL: HDL ratio was 2.37+0.97. Overall, 57.7 % was found to be dyslipidemic with above criteria, more so in males and in diabetics. Low HDLC was most common lipid abnormality in our population and male gender was found be single most important risk factor for low HDLC among studied variables. Serum TG levels were found to be significantly affected by age and presence of hypertension. *Conclusions*: The high prevalence of dyslipidemia in studied population is alarming, particularly so in younger population, even in rural areas and preventive measures should be taken early to reduce the burden of cardiovascular disease in the community.

Keywords- dyslipidemia, preventive health checkup, diabetes, hypothyroidism

Key Messages- dyslipidemia is now increasingly seen in general population and even younger population is not spared. There is strong need to improve dietary habits of younger generation to prevent rising epidemic of Coronary artery disease in India. Low HDL-C was most common lipid abnormality found in our study.

Citation: Karna S.K., et al. (2015) Prevalence of Dyslipidemia among Adults Attending Preventive Health Checkup Program of a Tertiary Care Hospital in Rural Gujarat. International Journal of Medical and Clinical Research, ISSN: 0976-5530 & E-ISSN: 0976-5549, Volume 6, Issue 1, pp.-321-325.

Introduction

According to WHO estimates, of 56 million global deaths in 2012, 68%, were due to noncommunicable diseases (NCD). Cardiovascular disease (CVD) was single most important cause accounting for 46% of total NCD death (31.2% of all deaths) worldwide [1]. In India, 24% of all deaths are due to CVD alone [2].

With growing urbanization and industrialization in Asia, there has been concomitant rise in dyslipidemia and CVD [3,4]. The prevalence is rising not only in cities but there is also a slow progression towards suburban and rural area [5,6].

Dyslipidemia is one of well-established independent major risk factors for cardiovascular disease and high cholesterol levels alone are estimated to cause 56 percent of global ischemic heart disease [7].

Primary prevention is an important aspect of reducing prevalence of disease in the community. Cardiovascular risk factor screening has become part of many health screening programs in India. Though many studies have looked into prevalence of dyslipidemia and other risk factors in CVD population, few studies have looked at prevalence of CVD risk factors among non CVD population in health screening subset.

In this cross sectional study, we analyzed the lipid profile of individuals who attended routine health checkup at our facility.

Material and Methods

Our study was a retrospective study on population, coming for routine health checkup at health screening program of Sri Krishna hospital, a tertiary care teaching hospital located in Rural Gujarat. The medical data of 1050 patients, not having known cardiovascular disease, and attending health screening program was taken from medical record department. The database included history of medical illness including CVD risk factors and laboratory results at the time of screening.

Blood samples were collected from antecubital vein after an overnight fast of at least 8 hrs. After clotting, blood was centrifuged to get serum for analysis.

The Lipid profile was measured on COBAS Integra 400 plus Ana-

lyzer. Serum HDL was measured by Homogeneous Enzymatic Colorimetric method, TG by Colorimetric endpoint GPO-PAP and total cholesterol by Colorimetric assay with endpoint CHOD-POD. LDL-C level were derived by Friedwald's formula [LDLC= TC-(HDL+ TG/5)] [8].

Lipid profile results were categorized as per NCEP-ATP III classification [9]. Total cholesterol <200 mg/dl, LDL-C < 130 mg/dl, HDL-C ≥ 40 and TG < 150 mg/dl were considered desirable. Dyslipidemia was defined as presence of one or more abnormal serum lipid values.

Plasma glucose was measured by Colorimetric Kinetic Hexokinase method in in COBAS Integra 400 plus Analyzer. Persons with fasting blood glucose >126 mg/dl or who were on medication for diabetes were considered as having diabetes mellitus. Whole Blood HbA1c was measured with Immunoturbidimetry method standardized according to IFCC method in COBAS Integra 400 plus Analyzer.

Serum TSH was measured by Electro-Chemiluminescent Immunometric Assay (Sandwich Principle) on COBAS e411 Analyzer.

Statistical Analysis

Student's t-test was used to analyze quantitative variables and Chi-square (X^2) test for qualitative variables. Pearson correlation was used for analyzing correlation of continuous variables. Logistic regression was used to derive modulators of individual component of lipid parameter. Statistics were carried out on statistical package (SPSS version 17.0, SPSS Inc., Chicago, USA) A two sided p value of <0.05 was considered statistically significant.

Results

Of 1050 study subjects, 33.2 % were younger than 45 years; 48.2% were males. Mean age of participants were 49.42+11.21(range 19-65 yrs.). There was no significant difference between mean age of males and females (49.6+ 11.0 yrs. vs 49.2+11.41yrs, p=0.483).

Overall, as many as 26.5% of screened subjects were diabetic and 31.8% of screened subjects were hypertensive. 14.6% of subjects were having both HTN & DM. 20.1 % cases had hypothyroidism.

The mean lipid profile of the study population were TC= 190+40 mg/dl, LDL= 108+32.6 mg/dl, HDL =49+14.6 mg/dl and TG 124+67.6 mg/dl. Mean TC: HDL ratio was 3.96+0.97 and mean LDL: HDL ratio was 2.37+0.97. The mean values were compared based on gender and presence of diabetes and the results are shown [Table-1], [Table-2].

Individual components of lipid parameters were further sub-categorized as per the NCEP-ATP III guidelines definition. The relative distribution of lipid abnormalities is shown as in [Fig-1]. The distribution among males and females are shown in [Table-3].

Overall, 57.7% were found to be dyslipidemia on screening, taking into consideration all 4 lipid parameters. The prevalence of individual component of lipid abnormalities in males and females are shown in [Fig-2].

The data was also analyzed for mixed vs isolated dyslipidemia among 3 major lipid parameters and the results are shown in [Table -4].

Relationship of lipid parameters with HTN, DM, hypothyroidism and sex was determined with chi-square statistic. The odds of having hypertriglyceridemia were 1.68 times higher in hypertensive, 1.71 times in diabetics, 0.69 times in hypothyroidism and 1.68 times in males. The odds of having low HDL were 1.43 times in diabetics and 4.9 times in males. The odds of having low HDL were not greater in presence of HTN or hypothyroidism.

Table 1- Gender based differences in lipid parameters

Parameters	Male (N=506)	Female (N=544)	P Value
TC(mg/dl)	180.3 ± 40	185.3 ± 39.3	0.041*
LDL(mg/dl)	108.6 ± 34.3	107.5 ± 30.9	0.591
HDL(mg/dl)	43.96 ± 13.2	53.9 ± 14.1	<0.001*
TG(mg/dl)	136.14 ± 71	118.26 ± 112	0.002*
LDL:HDL	2.66 ± 1.06	2.12 ± 0.8	<0.001*
TC:HDL	4.34 ± 1.35	3.61 ± 1.06	0.001*
VLDL(mg/dl)	27.48 ± 14.96	23.65 ± 22.47	0.001*

*Statistically significant

Table 2- comparison of lipid profile based on presence or absence of diabetes mellitus

	Non DM(N=772)	DM(N=278)	P value
TC (mg/dl)	182.74 ± 37.2	183.4 ± 46.8	0.824
LDL(mg/dl)	109.16 ± 0.85	105.01 ± 36.8	0.094
HDL(mg/dl)	49.74 ± 14.8	47.45 ± 13.6	0.024*
VLDL(mg/dl)	23.61 ± 11.77	30.73 ± 31.48	<0.001*
TG(mg/dl)	117.89 ± 58.8	144.36 ± 84.6	<<0.001*
TC:HDL	3.91 ± 1.2	4.1 ± 1.44	0.026*
LDL:HDL	2.37 ± 0.94	2.38 ± 1.04	0.874

*Statistically significant

Table 3- Gender based distribution of cholesterol levels in population as per NCEP-ATP III Classification

Parameters	Category	Male (N=506)	Female (N=544)	P value (males vs females)
TC	Desirable (<200)	71.90%	65.80%	X^2 = 5.681 df= 2 P= 0.058
	Borderline high (200-239)	20.90%	27.20%	
	High (≥240)	7.10%	7%	
LDL	Optimal (100)	38.50%	41.90%	X^2 =3.44 df = 4 P=0.487
	Near Optimal (100-129)	36.30%	35.30%	
	Borderline high (130-159)	19.00%	17.60%	
	High (160-189)	4.40%	4.50%	
	Very High (≥ 190)	1.80%	0.70%	
TG	Normal (< 150)	68.90%	81.30%	X^2 =31.03 df = 3 P= < 0.001*
	Borderline High (150-199)	15.00%	12.10%	
	High (200-499)	15.80%	6.10%	
	Very High (≥ 500)	0.20%	0.60%	
HDL	Low (< 40)	42.70%	13.20%	X^2 =138.04 df = 2 P< 0.001*
	Normal (40 - 59)	47%	57%	
	High (≥ 60)	10.10%	29.80%	
LDL:HDL	Normal (< 3.5)	80.40%	93.80%	X^2=42.04 df=1 P<0.001*
	High (> 3.5)	18%	5.30%	

*Statistically significant; X2=chi square statistic; df = degree of freedom

Pearson correlation was used to identify relationship between observed lipid values with age and FBS. LDL positively correlated with increasing age (Pearson r=0.062, p=0.044) though the correlation was weak. TC, TG, VLDL positively correlated with FBS while rising FBS was associated with lower HDL. Strongest correlation of FBS was seen with TC (r=0.384, p<0.001) and TG (r=0.219, p <0.001).

Logistic Regression analysis was used to develop a model for prediction of dyslipidemia based on age, sex, presence or absence of DM, HTN and hypothyroidism. The logistic regression model for likelihood of hypertriglyceridemia was statistically significant {chi-square $X^2(5) = 38.036$, $P < 0.001$}. The model explained 5.7% (Nagelkerlke R^2) of the variance of hypertriglyceridemia and correctly classified 75.6% of cases.

From the logistic regression model, the odds for having hypertriglyceridemia were 1.9 times greater for males as compared to females, and 1.5 times greater for those having hypertension; after adjustment for other variables. The odds of having hypertriglyceridemia were not significantly associated with age, hypothyroidism and diabetes.

Logistic regression Model for likelihood of low HDL was statistically significant (chi square 113.02, df = 5, $P < 0.001$). The model explained 15.9% (Nagelkerlke R^2) of the variations in HDL and correctly identified 72.3% of low HDL cases. The odds of having low HDL were 4.7 times more in males as compared to females ($P < 0.001$),after adjustment for other variables. Age, hypothyroidism, DM and HTN did not add significantly to the model.

Table 4- Pattern of Dyslipidemia in study population

Parameters	Male (506) N (%)	Female (544) N (%)	All (1050) N (%)
Mixed Dyslipidemia			
High TG, High LDLC, Low HDLC	29 (5.73%)	7 (1.3 %)	36 (3.43%)
Combined Dyslipidemia			
High TG & Low HDLC	67 (13.24%)	18 (3.3 %)	85 (8.1%)
High TG & High LDLC	29 (5.73%)	32 (5.88%)	61 (5.8 %)
High LDLC & Low HDLC	27 (5.33 %)	5 (0.9 %)	32 (3 %)
Isolated Single Parameter Dyslipidemia			
High TG	32 (6.32 %)	45 (8.27 %)	77 (7.33 %)
High LDLC	40 (7.90 %)	79 (14.5 %)	119 (11.3 %)
Low HDLC	93 (18.37 %)	42 (7.7 %)	135 (12.8 %)
Total (Any Dyslipidemia)	317 (62.9 %)	228 (41.9 %)	545 (51.9 %)

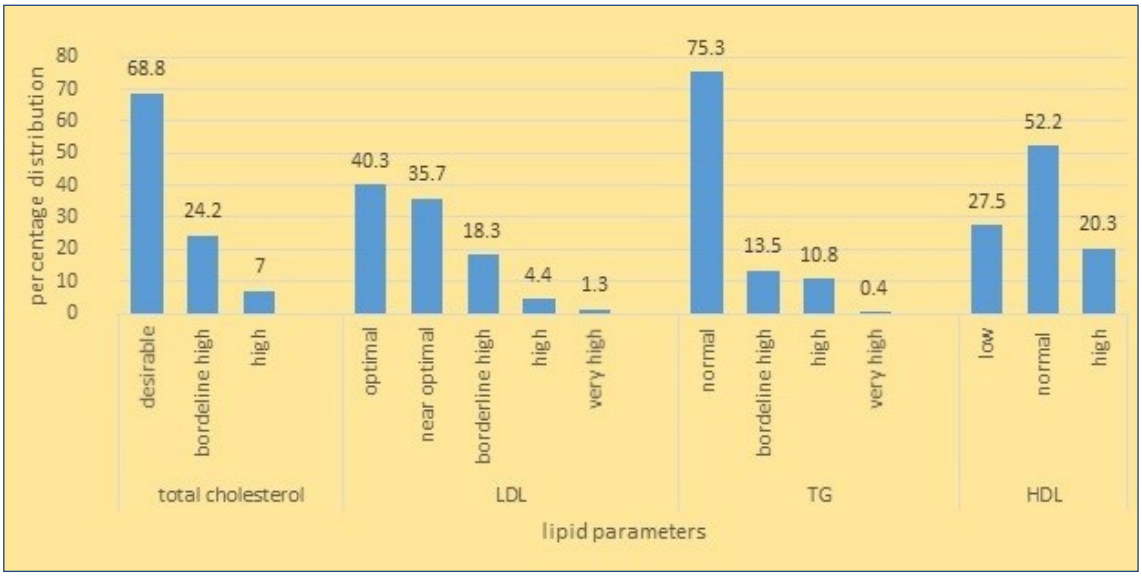

Fig. 1- Distribution of lipid parameters in the population as per NCEP ATP III criteria

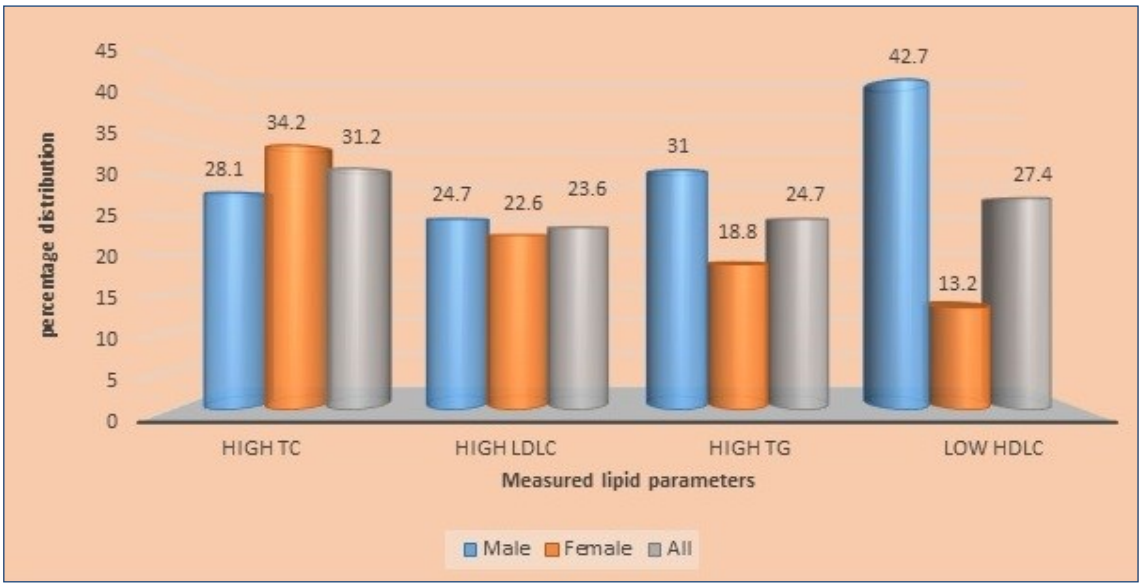

Fig. 2- Prevalence of individual components of abnormal lipid profile in the population (in %)

Discussion

Hypertriglyceridemia, abnormally high LDL-C and low HDL-C are well known risk factors for cardiovascular disease in all age groups.

Overall prevalence of dyslipidemia in our study was 57.7% which is of great public health concern. The prevalence of dyslipidemia was found to be 50.2 % in younger population less than 40 yrs. old that is alarming.

HDL was found to be significantly higher; TG and VLDL significantly lower in females as compared to males, thus driving LDL: HDL ratio and TC: HDL ratio significantly low and favorable in females.

Similarly, out of observed lipid parameters, HDL was significantly low and VLDL and TG was significantly higher in diabetics as compared to nondiabetic, causing unfavorable lipid profile for diabetics overall.

Apart from dyslipidemia, lifestyle diseases like diabetes and hypertension were widely prevalent in studied population. Overall 43.7% of population was suffering from either HTN or diabetes or both. Though the prevalence was significantly higher in those more than 40 yrs. old (49.8% vs 41.9%; $p<0.01$), 41.9 % prevalence in younger population is of great concern to society and points at need of preventive strategies to be targeted at any early age.. The prevalence among females was low as compared to males (50.5% vs 65.5%, $p<0.001$).

Our results are consistent with other studies from India. In study by Prabhakaran [10] among men in large industry in northern India, the prevalence of dyslipidemia was found to be 62%, which is near to 65% in our study. Though the WHO prevalence for dyslipidemia in India of 27.1 % [2] is lower as compared to our data, this is population prevalence while ours is prevalence limited to health screening subset. Our study differs from other 2 similar studies from India where the prevalence in younger population was found to be as high as 80% [11,12].

The most common lipid abnormality in our population was low HDLC. This is similar to most other studies in immigrant Indians [13] and from north India [5,14-18] where low HDLC is predominant lipid abnormality along with high TG. In contrast most studies from south India has shown high LDLC and TG as predominant lipid abnormality rather than low HDLC [19-22]. One published study from western India [12] from metropolitan population has shown high LDLC as most common lipid abnormality in hospital, and ours is first study of its kind from the rural population of western India.

Conclusion

This study showed alarming prevalence of dyslipidemia among health screening population along with high proportion of diabetics and hypertensive, even in younger population. Diet and lifestyle modifications, increased physical activity and therapeutic interventions aimed at reducing dyslipidemia are need of the hour to reduce growing menace of coronary artery disease in the community.

Limitations

As this was a retrospective study, we could not get the data of BMI. No data on statin usage by individuals were available, neither were dietary habits taken into account. However, the data presented here represents the real world data irrespective of BMI or lipid lowering therapy.

Abbreviations

CVD: Cardiovascular Disease

DM: Diabetes Mellitus

FBS: Fasting Blood Sugar

HbA1c: Glycosylated Hemoglobin

HDL(C): High Density Lipoprotein (Cholesterol)

HTN: Hypertension

LDL(C): Low Density Lipoprotein (Cholesterol)

NCD: Non-communicable Disease

NCEP-ATP III: National Cholesterol Education Program-Adult Treatment Panel III

TC: Total Cholesterol

TG: Triglycerides

VLDL: Very Low Density Lipoprotein

WHO: World Health Organization

Acknowledgement: We acknowledge the support and help provided by Medical Record Department of Sri Krishna Hospital for giving access to medical database.

Conflict of Interest: None declared.

References

[1] World Health Organization (2015) *NCD mortality and morbidity*, Global Health Observatory, Geneva: WHO.

[2] World Health Organization (2011) *Noncommunicable diseases country profiles* 2011.

[3] Khoo K.L., Tan H., Liew Y.M., Deslypere J.P. & Janus E. (2003) *Atherosclerosis*, 169(1), 1-10.

[4] Janus E.D., Postiglione A., Singh R.B. & Lewis B. (1996) *Circulation*, 94(11), 2671-2673.

[5] Chadha S.L., Gopinath N. & Shekhawat S. (1997) *Bulletin of the World Health Organization*, 75(1), 31.

[6] Chaisiri K., Pongpaew P., Tungtrongchitr R., Phonrat B., Kulleap S., Sutthiwong P., Intarakhao C., Mahaweerawat U., Khongdee W., Sanchaisuriya P., Saowakontha S., Merkle A. & Schelp F.P. (1997) International Journal for Vitamin and Nutrition Research, 68(3), 196-202.

[7] Prentice T. (2002) *World Health Report: Reducing Risks, Promoting Healthy Life*. World Health Organization, Geneva.

[8] Friedewald W.T., Levy R.I. & Fredrickson D.S. (1972) *Clinical Chemistry*, 18(6), 499-502.

[9] Antonopoulos S. (2002) *Circulation*, 106(25), 3143-3421.

[10] Prabhakaran D., Shah P., Chaturvedi V., Ramakrishnan L., Manhapra A. & Reddy K.S. (2005) *The National Medical Journal of India*, 18(2), 59-65.

[11] Sam J.E., Sam N.J., Ganesh H.K. & Maben E.V.S. (2014) *International Journal of Biological & Medical Research*, 5(3), 4305-4308.

[12] Sawant A.M., Shetty D., Mankeshwar R. & Ashavaid T.F. (2008) *The Journal of the Association of Physicians of India*, 56, 99-102.

[13] Malhotra P., Singh M.M. Kumar R. & Kumari S. (1995) *Indian Heart Journal*, 48(6), 737-738.

[14] Kumar R., Singh M.M.C., Malhotra P., Thakur J.S., Bali H., Ganguly N.K. & Sharma B.K. (1997) *Canadian J. Cardiol*., 13 (B), 200B-201B.

[15] Gupta R., Prakash H. & Kaul V. (1997) *The Journal of the Association of Physicians of India*, 45(4), 275-279.

[16] Gopinath N., Chadha S.L., Sehgal A., Shekhawat S. & Tandon R. (1993) *Indian Heart Journal*, 46(6), 325-327.

[17] Wander G.S., Khurana S.B., Gulati R., Sachar R.K., Gupta R.K. Khurana S. & Anand I.S. (1993) *Indian Heart Journal*, 46(6), 319-323.

[18] Chadha S., Radhakrishnan S., Ramachandran K. & Gopinath N. (1989) *Indian Journal of Community Medicine*, 14(4), 141-150.

[19] Joglekar S.J. & Nanivadekar A.S. (1995) *Indian Heart Journal*, 48(4), 371-374.

[20] Joglekar S.J., Warren S.L., Prabhu A.T., Kulkarni S.S. & Nanivadekar A.S. (1996) *Indian Heart Journal*, 49(3), 275-278.

[21] Rajmohan L., Deepa R., Mohan A. & Mohan V. (2000) *Indian Heart Journal*, 52(4), 400-406.

Joseph A., Kutty V.R. & Soman C.R. (1999) *Indian Heart Journal*, 52(1), 29-35.

[1]