International Journal of Medical and Health Research
www.medicalsciencejournal.com
ISSN: 2454-9142
Received: 01-04-2022, Accepted: 15-04-2022, Published: 30-04-2022
Volume 8, Issue 4, 2022, Page No. 20-24

Evaluation of association between age and dyslipidemia in Kishanganj district of Bihar. An observational cross sectional study

Sourav Chattopadhyay[1], Abhinav Chaudhary[2*], Sumit Singh Kaushal[2], Sandeep Bhardwaj[2], Shubham Shukla[2], Aniket Sinha[2], Suman Kumar Singh[2]

[1] Professor, Department of General Medicine, M.G.M. Medical College and L.S.K. Hospital, Kishanganj, Bihar, India

[2] Resident, Department of General Medicine, M.G.M. Medical College and L.S.K Hospital, Kishanganj, Bihar, India

Abstract

Introduction: Cardiovascular disease has become a leading cause of disability and premature mortality globally. According to the Global Burden of Diseases, Injuries, and Risk Factor Study 2015, cardiovascular disease affected an estimated 422·7 million people and caused an estimated 17·9 million deaths worldwide in 2015, comprising 31% of all global deaths [1]. Dyslipidemia is an important atherosclerotic risk factor. Dyslipidemia is a multifactorial disorder, which arises from complex interactions among genetic and environmental risk factors [2]. The NCEP ATP III Classification defines LDL cholesterol levels less than 100 mg\dl as optimal, Total Cholesterol level less than 200 mg\dl as desirable and HDL Cholesterol between 40 to 60 mg\dl as normal [3]. There is an emerging evidence of premature coronary artery disease occurring in Asian Indians at least 10 years earlier as compared to other ethnic groups. Several studies in the recent past have suggested total cholesterol, Low Density Lipoproteins (LDL), triglycerides levels have increased among young urban populations. The primary objective of our study was to investigate the dynamic trends in total cholesterol (TC), triglyceride (TG), high-density lipoprotein cholesterol (HDL-C) and low-density lipoprotein cholesterol (LDL-C) levels with ageing.

Methods: This is a descriptive cross-sectional study carried out on patients visiting OPD of Department of General Medicine. Patients were divided into 3 groups with age 18 year to 40 year, 41 year to 60 year and >60 year by involving 1989 subjects of whom 532 were between 18 year to 40 year, 935 were between 41year -60 year and 522 were over 60 year of age. This study included measurement of fasting serum lipid profile consisting of total cholesterol, Low Density Lipoprotein, Triglycerides & High Density Lipoproteins.

Results: The study revealed higher prevalence of dyslipidemia in the group <60 year. Mean cholesterol was high in age group 18 – 40 years. The highest mean triglycerides was found in the age group between 41-60 years. The highest mean HDL levels was found in the age group above 60 years. Statistically significant difference in mean was found with cholesterol, LDL, triglycerides between the age group of 18- 40 years and more than 60 years. Statistically significant difference was not found between 18 – 40 years and more than 40 years to 60 years for HDL

Conclusions: Higher percentage of dyslipidemia was found in the age groups less than 60yrs. Age related trends in lipid levels according to sex are essential for ‘precision medicine’.

Keywords: dyslipidemia, atherosclerosis, cholesterol, low density lipoproteins, cholesterol andtriglyceride

Introduction

Various studies support increased prevalence of Atherogenic Dyslipidemia in Asian Indian populations compared to western populations which may be due to their less physical activity and consumption of carbohydrate rich and low polyunsaturated fatty acid (PUFA) diet [4].

Age is a classic unmodifiable risk factor, and LDL-C is a classic modifiable risk factor for CVD.9 The association between dyslipidaemia and ASCVD has been explored for decades [5].

In 1990, Austin and colleagues first explained Atherogenic Dyslipidemia (AD) as a clinical condition Characterized by elevated levels of serum triglyceride (TG) levels and small-dense low-density lipoprotein (sdLDL) particles with low levels of high-density lipoprotein cholesterol (HDL-C), highlighting its atherogenic lipoprotein phenotype. Additionally, elevated levels of large TG rich very low-density lipoproteins (VLDL) and apolipoprotein B (Apo B) and reduced levels of small high-density lipoproteins plays critical role in AD [4]. Atherosclerosis has been described as a lipid-driven inflammatory disorder of the arterial wall.

Atherogenic lipoproteins (LDL and some smaller species of the triglyceride-rich lipoproteins) have the ability to infiltrate the arterial wall thereby initiating atherosclerosis. After entering the arterial wall, the particles bind to proretentive extracellular molecules, become trapped, and are modified through oxidation and other processes, whi

-ch increase their inflammatory properties and their unregulated uptake by macrophages. The macrophages become engorged with lipid, they form foam cells, and this process triggers a potentiation of the inflammatory response through release of compounds that increase recruitment of additional monocytes and macrophages. The accumulation of foam cells leads to the development of a fatty streak that initiates the proliferation of smooth muscle cells creates a fibrous cap or plaque, as the plaque matures the atherogenic particles continue to infiltrate lipid-rich areas formed within the fibrous plaque. Inflammation triggers processes that weaken the fibrous cap and make the plaque susceptible to rupture [7].

Atherogenic lipoproteins play important roles in the initiation of atherosclerosis, progression to a mature plaque and, eventually,plaque instability and rupture [7].

Though all LDLs are reported as atherogenic but sdLDLs are more atherogenic and serves as a better predictor of cardiovascular risk than LDL-C. They have an increased ability to penetrate arterial intima, susceptibility to retention in the extracellular matrix by binding to arterial proteoglycans, and have decreased antioxidant capacity. Increase in sdLDL generation has been noted when TG levels are >1.5 mmol/L [4].

Since these particles have lower affinity to LDL-receptors on hepatocytes, there is decrease uptake and clearance of sdLDL, leading to their increased presence in the systemic circulation [4].

The FHS showed HDL-C as the most potent lipid predictor of CHD risk in men and women aged >49 years. Every 1 mg/dl increment in HDL-C was associated with 2 and 3% decreased risk of CHD in men and women, respectively [4]. The anti-atherogenic effects of HDL-C are attributed to reverse cholesterol transport and host of other protective activities. The reverse cholesterol transport involves transfer of excess cholesterol from lipid-laden macrophages (foam cells) present in peripheral tissues to the hepatocytes via HDL for metabolism or excretion into bile [4]. The other protective activities of HDL-C against atherosclerosis are due to its antioxidant (counteracting LDL oxidation), anti-inflammatory, antithrombotic/profibrinolytic (reducing platelet aggregation and coagulation), and vasoprotective (facilitating vascular relaxation and inhibiting leukocyte chemotaxis and adhesion) effects [4]. Apo B/ApoA-1 ratio has been considered as an accurate predictor of CVD risk, however several studies have reported LDL-C/HDL-C ratio to be more accurate [4].

Methods

We investigated the Age related trends in lipid profile through an observational cross sectional study design. Study population was divided into three groups: group I: age group of 18 to 40 years, Group II: 41-60 years and Group III: more than 60 years of age. Subjects included this study were more than or equal to 18 years of age of either sex. Subjects excluded were adults with known history of coronary heart diseases / terminally ill patients / suffering with acute or chronic illness/ patients with less than 18 years of age/ on medication with hypolipidemic drugs. Study was conducted for a period of one year between May 2019 to May 2020. This study was conducted on 2560 patients visiting the OPD, Department of Medicine, in Mata Gujri Memorial Medical College and Lions Seva Kendra Hospital, Kishanganj. Approval from ethical committee was granted for the study. Estimation of fasting lipid profile: after an overnight fasting, 5ml of venous blood was drawn after taking aseptic precautionary measures. Serum was obtained by centrifugation at 3000 rpm for 10 minutes. The serum was analysed for Total cholesterol by CHOD- POD (End Point), Triglycerides by Enzymatic (GPO-PAP), LDL cholesterol & HDL Cholesterol by Homogenous Method and Direct Measurement by using auto analyzer within one hour of collection.

Statistcal Analysis

Data collected was entered in Microsoft 2011 excel spreadsheet, compiled and analysed using SPSS software version 22. Mean, standard deviation, and standard error were determined for each group. Univariate analysis was carried out using Pearson Chi-square test and Comparison of differences in mean of these groups was analyzed using students and p- value was calculated. P-value of <0.05 was considered as statistically significant t test.

Results

In this cross sectional study, fasting lipid profile was estimated among different age groups in Kishanganj district of Bihar. 2560 patients were endorsed to participate in the study as subjects. The study subjects were divided into 3 groups. Group 1within the age group of 18 to 40 years, group 2 were within the age group 41-60 years and group 3 with the age more than 60 years. Out of which 756 were 18 to 40 year of age, 928 were between 41-60 year and 876 were over 60 years.

The socio demographic profile of the study subjects were collected. 68% of the study subjects were found to be male. Fasting lipid profile of all study subjects included total cholesterol, LDL cholesterol, HDL cholesterol & triglycerides.

he trends in HDL-C levels were relatively unique, mainly manifesting as irregular trends with age, with women’s HDL-C levels being higher than men’s for all age groups.

The results of all 3 groups were tabulated with cholesterol<200mg/dl and >200mg/dl, HDL >45mg/dl and <45 mg/dl, triglycerides <150 mg/dl and >150 mg/dl, LDL < 100mg/dl and >100 mg/dl. Among the 3 groups highest mean serum cholesterol was observed in age group of 18 to 40 years. Mean HDL was highest in > 60yrs age group, highest Mean triglyceride level 147.21 was found between 41-60 year age group and mean LDL were high in 18 to 40 year age group as indicated in fig 1 to 4. Statistically significant difference was found in mean cholesterol, LDL Cholesterol and triglycerides between age groups of <40 and >60 years. There was no statistically significant difference between <40 year age group and 41 to 60 years age group.

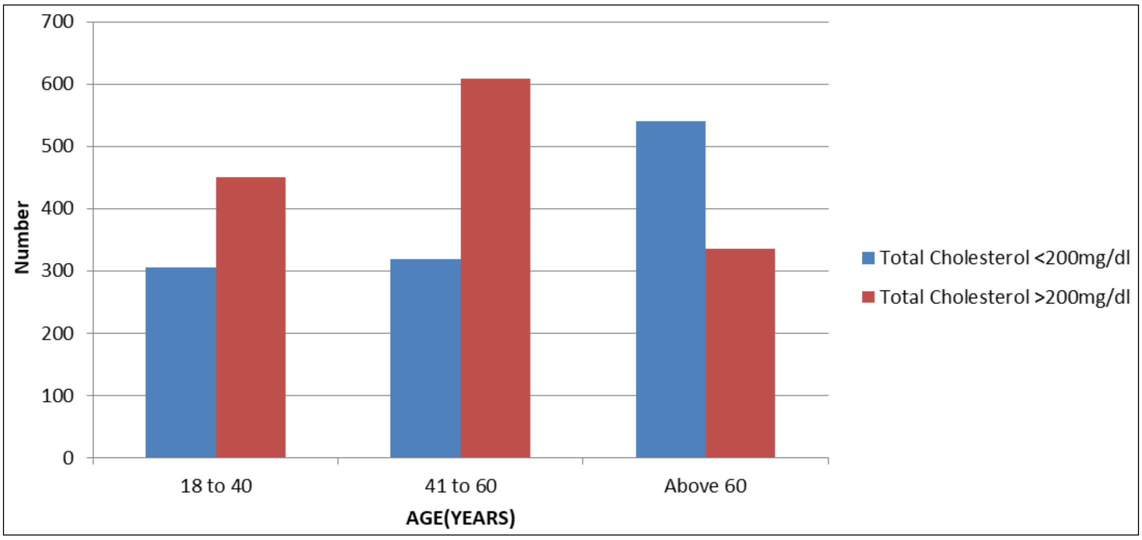

Fig 1: Distribution of Serum Total Cholesterol in different Age Groups

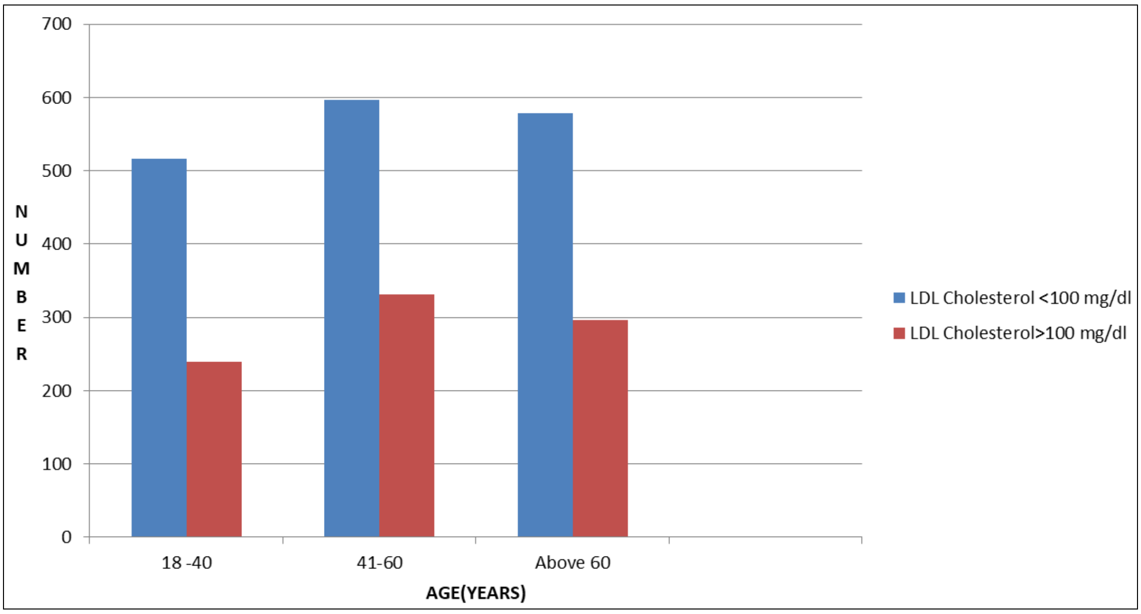

Fig 2: Distribution of serum LDL Cholesterol in different Age groups

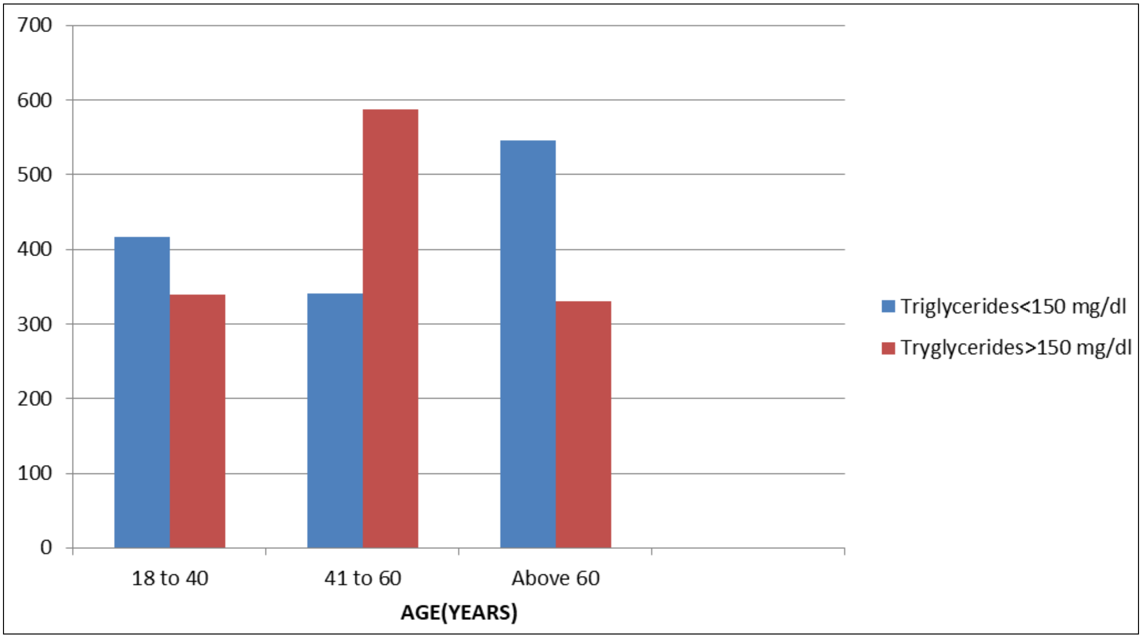

Fig 3: Distribution of serum Triglycerides in different Age group

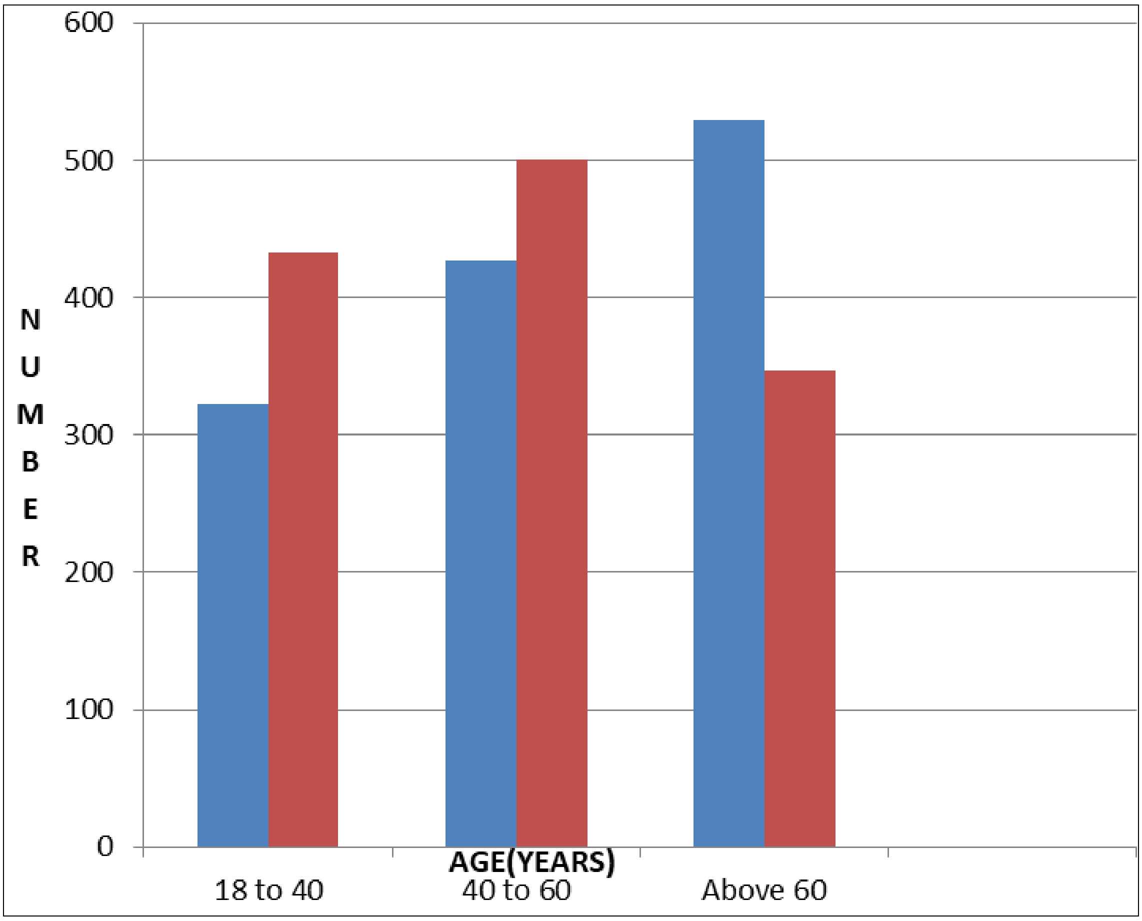

Fig 4: Distribution of serum HDL Levels in different Age groups

Table 1: Differences in Lipid Profile between Age 18 to 40 Years & more than 60 years

Lipid profile	Age group	N	Mean±SD	'p' value
Total Cholesterol	1	756	188±34.2	
	3	876	176±28.6	0.00
LDL Cholesterol	1	756	122±26.7	
	3	876	109±25.9	0.00
Triglyceride	1	756	156±37.9	
	3	876	129±32.5	0.00
HDL Cholesterol	1	756	32±11.8	
	3	876	49±14.9	0.126
p value ≤ 0.05 is statistically significant. Difference in mean Group-1 age Less than 40 Years & Group-3 age More than 60 Years				

Discussion

A report from the Framingham study with 2222 men and 2677 women aged 20–79 years showed that among younger age groups, plasma TC levels of each group rose in concert with age but that levels declined in older individuals [5] The results of our study is consistent with the report.

In comparison to western populations, Asian Indians possessed significantly lower levels of HDL and LDL-C with hypertriglyceridemia; had 53.2% prevalence of high sdLDL than 29.9% and 18.9% prevalence in whites and blacks, respectively; and significantly higher proportion of Indians (66%) had TG/HDL ratio >3 than 21.1% whites and 13.7% blacks. Besides being more dyslipidaemic, Indians had higher intra-abdominal visceral fat which increased their insulin resistance and CVD risk than western populations. In the comparison between whites and blacks, blacks had less likelihood of AD due to significant lower levels of total cholesterol, LDL-C, LDL pattern B, and triglycerides than whites [4]

The data from Framingham Heart Study (FHS) showed low HDL-C levels to pose substantial risk despite presence of very low LDL-C levels. As HDL-C decreases, it contributes significantly to coronary heart disease (CHD) risk at all levels of LDL-C and even when LDL-C levels were optimal (<100 mg/dL), lower HDL-C level correlated with higher risk of CHD. The study also suggested that non-HDL-C (i.e., total cholesterol minus HDL-C) served as a stronger predictor of CHD risk than LDL-C, irrespective of TG levels [4].

Sabir AA, et al., found out Rural-urban difference in plasma lipid Levels and prevalence of dyslipidemia in Hausa-Fulani of North-Western Nigeria, demonstrated that the mean serum Total cholesterol was significantly higher in

urban than rural participants [8].
Similar results have been found by our study. The PROSPER (Prospective Study of Pravastatin in the Elderly at Risk) study was a randomised, double blind, placebo-controlled trial involving 5804 patients aged 70-82 years. The study reported LDL-C/HDL-C ratio as the most powerful measure of CVD risk in the elderly people [4].
The PROCAM study also reported a continuous and graded relationship between the LDLC/HDL-C ratio and CVD mortality.
The FHS also reported LDL-C/HDL-C ratio to be a stronger predictor of CVD than the levels of LDL-C or HDL-C alone [4].
The deaths due to CAD abruptly increased when the LDL-C/HDL-C ratio was between 3.7 and 4.3. One unit increase in the LDL-C/HDL-C ratio was associated with 53% increase in risk of MI. Another study reported 75% increase in the risk of MI with one-unit increase in LDL-C/HDL-C ratio [4].
According to the recent NCEP guidelines, the LDL-C/HDL-C ratio of 2.5 governs the starting point of statin therapy and increased CVD deaths were reported at the LDL-C/HDL-C ratio of 3.3-3.7 [4].
According to our data, the starting levels of TC, TG and LDL-C in men are higher than those in women, and men face decades of upward trends of these lipids and lipid proteins in the =40, =40 and =60 age ranges, respectively. We think these lipid level trends render men more susceptible to ASCVD than women [4].
Women in younger age group, have a much lower risk for cardiovascular events compared with men of their age. Reasons for protection from CVD in younger women are complex, but a significant contribution can be atributed to the greater high-density lipoprotein (HDL) levels in younger women, which is an effect of estrogen [6]. India Heart Watch study was conducted among urban middle class subjects in 11 cities of India with fasting lipid estimation. 21 Prevalence of various cholesterol lipoprotein abnormalities after age-adjustment in men and women, respectively were, total cholesterol >200 mg/dl in 25.1% and 24.9%, LDL cholesterol >130 mg/dl in 16.3% and 15.1% and >100 mg/dl in 49.5% and 49.7%, HDL cholesterol <40 mg/dl (men) and <50 mg/dl (women) in 33.6% and 52.8%, total HDL cholesterol ratio >4.5 in 29.4% and 16.8% and triglycerides>150 mg/dl in 42.1% and 32.9% [8]. In the FitHeart study Fasting blood samples from 46,919 subjects aged 18–96 years were obtained. The mean (±1 SD) age was 49.6 ±13.2 years. The pan-India averages (mg/dl) were: Total cholesterol 176.7 ± 41.31 mg/dl, LDL cholesterol 110.5 ±34.0 mg/dl, HDL cholesterol 43.2±11.7 mg/dl, non-HDL cholesterol 133.5±41.3 mg/dl and triglycerides 162.3±16.7 mg/dl. There were large inter-state variations in various cholesterol lipoproteins in this study [8].

Conclusion

There are no large prospective studies in India that have determined association of various cholesterol fractions with CHD outcomes. Case-control studies have reported that there is significant association of acute coronary events with raised apolipoprotein B, total cholesterol, LDL cholesterol and non-HDL cholesterol and inverse association with high apolipoprotein A and HDL cholesterol. Large population study is required to substantiate the results of this study. It is also the need of hour to devise comprehensive strategy for awareness programme for screening of all age groups on periodic basis. Limitations of this report include the following. Lipid metabolism is associated with race/geographic origin, ethnic origin, education background, socioeconomic status, occupational status and religious affiliation association of these factors were not evaluated. The risk of CVD increases exponentially for women as they enter menopause and estrogen levels decline. This becomes vitally important for women in menopausal transition, when preventive measures can significantly improve quality and longevity of life [6]. Reproductive factors, such as parity and menopause, were not included in the study. hsCRP, genetic factors, sex hormone status, dietary pattern, stress and mental have also been found to be associated with changes in lipid metabolism, and our study did not take these factors in consideration.

Apo B/ApoA-1 ratio

References

1. Piege song *et al*. Global and regional prevalence, burden, and risk factors for carotid atherosclerosis: a systematic review, meta-analysis, and modelling study; Lancet Glob Health,2020:8:e721-29.
2. So Mi Jemma cho *et al*. Associations between age and dyslipidemia are differed by education level: The Cardiovascular and Metabolic Diseases Etiology Research Center (CMERC) cohort; Lipids in Health and Disease, 2020. https://doi.org/10.1186/s12944-020-1189-y
3. Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) https://www.nhlbi.nih.gov/files/docs/guidelines/atp3xsum.pdf
4. Manjunath CN *et al*. Atherogenic dyslipidemia; Indian Journal of Endocrinology and Metabolism.
5. Feng L *et al*. Age-relatedtrends in lipid levels: a large-scale cross-sectional study of the general Chinese population. *BMJ Open*,2020:10:e034226. doi:10.1136/bmjopen-2019-034226
6. Deepti GI *et al*. AGE RELATED DIFFERENCE IN THE LIPID PROFILE IN NORMAL HEALTHY WOMEN NUJHS,2014:4(2). ISSN 2249-7110.
7. Terry A. Jacobson *et al*; National Lipid Association Recommendations for Patient-Centered Management of Dyslipidemia:Part 1—Full Report;Journal of clinical lipidology.
8. Rajeev Gupta *et al*. Recent trends in epidemiology of dyslipidemias in India; http://dx.doi.org/10.1016/j.ihj.2017.02.020