International Journal of Biomedical Research

ISSN: 0976-9633 (Online)
Journal DOI:10.7439/ijbr
CODEN:IJBRFA

Research Article

Establishment of lipid profile in healthy population of middle district of Southern Tamil Nadu

D. D. Venkataraman[1], N. Sivaranjani[*2], G. Elango[1], R. Pravin Kumar[3] and S.Venkata Rao[2]

[1]*Department of Medicine, Dhanalakshmi Srinivasan Medical College and Hospital, Perambalur-621212, Tamil Nadu.*
[2]*Department of Biochemistry, Dhanalakshmi Srinivasan Medical College and Hospital, Perambalur-621212, Tamil Nadu.*
[3]*Department of Pharmacology, Narayana Medical College, Nellore, Andhra Pradesh.*

***Correspondence Info:**
Dr. N. Sivaranjani
Assistant professor,
Dhanalakshmi Srinivasan Medical College and Hospital, Perambalur-621212, Tamil Nadu, India
E-mail: ranjani_09@yahoo.co.in

Abstract

Since cardiovascular diseases (CVD) are posing a major health hazard with high grade mortality rate, it necessitates a careful study of lipid profile among the population. Dyslipidemia is a major risk factor in the pathogenesis of many vascular diseases including coronary artery disease (CAD). Our study aimed to evaluate the reference interval of lipid profile in healthy population of Perambalur, middle district of Southern Tamil Nadu. Fasting blood samples of 986 healthy Tamil population of Perambalur District whose Body Mass Index (BMI) is normal, were tested for lipid profile, i.e. Total Cholesterol (TC), Triglycerides (TGL), High density lipoprotein cholesterol (HDL-C), Low density lipoprotein cholesterol (LDL-C) and Very low density lipoprotein cholesterol (VLDL-C). The mean values obtained for TC, TGL, LDL-C showed an increase trend with age, while HDL-C level showed a decrease with the age. In case of women above 60 years, Cholesterol level and LDL-C was found to be increased. Our study suggests that clinical assessment and treatment modalities of patient should be made on the basis of these reference values for Middle East population of Tamil Nadu.

Keywords: Lipid profile, Reference interval, Coronary artery disease

1. Introduction

Cardiovascular diseases (CVD) are emerging as the major cause of deaths globally. It is predicted that CVD will be the largest cause of disability and death in India by year 2020.[1] According to medical certificates for death, 25.1 % of total deaths of urban areas are attributed to disease of circulatory system. Therefore, it was assumed that mortality rates due to CVD in rural areas are expected to be half of CVD specific mortality rate in urban areas.[2] Social and individual changes that accompany urbanization clearly play a role because plasma cholesterol levels tend to be higher among urban residents than among rural residents.[3] Dyslipidemia includes all lipid and lipoprotein abnormalities, which are a potent and treatable risk factor for progression of coronary artery disease.[4] An assessment of plasma lipid profile holds a paramount importance in CVD was debated much, and a widely studied subject since the last 50 years.

To avoid the problems with normal values and the values obtained from an individual under clinical investigation, reference value is fixed[5] and it is also important to compare patient value with reference value for medical diagnosis.

Unsurprisingly the plasma lipid values of different populations from different regions were reported to have separate cut off values for their local population. The diversities in lipid profiles between various populations may be

unifactorial or multifactorial, like socio-economic, geographic conditions, races, eating habits, age and sex, which influence the reference range.[6] National Cholesterol Education Program (NCEP) oblige to establish a normal reference interval for plasma lipids in Indians.[7] A small number of studies have been carried out in Northern population of India to establish reference intervals but no study has been conceded in the Tamil Nadu population.[8,9,10,11] Hence, the present study was conceded to establish a reference interval for lipid profile in Perambalur, Middle East Tamil Nadu population with the same axiom.

2. Materials and Methods

In one year study period, 1245 normal healthy subjects of middle east District of Southern Tamil Nadu (Perambalur) attending the Department of Medicine and Central Laboratory Biochemistry Research wing of Dhanalakshmi Srinivasan Medical College Hospital, Perambalur from November 2012 – October 2013 were enrolled into the study.

Out of the 1245 subjects, 986 healthy subjects from lower to moderate - income families of various age groups either sex were selected for establishing the reference values using IFCC exclusion criteria: a) systemic diseases – renal failure, congestive heart disease, chronic respiratory diseases, liver diseases, malabsorption syndrome b) Co-morbid conditions – hypertension, diabetes c) Modified physiological states – pregnancy, psychological and mental disorders, food intake prior to blood collection and physical training, d) Individuals receiving pharmacologically active agents are excluded eg. Intake of alcohol, tobacco, OCP therapy, patients under Hypolipidaemic drug therapy, replacement or supplementation therapy like Insulin e) other factors – obesity (BMI>30 kg/m^2), lipemic samples. The reference population was grouped according to the age and sex. The 97.5 percentile and 2.5 percentile formed the upper and lower reference limits of the population. Analysis was performed using the commercially available statistical software SPSS – 10.0.[12]

Blood samples were drawn after an overnight fast of 12 hours. Serum was separated and analyzed within 3 hours of collection. Lipid profile was determined by using enzymatic kit methods using Fully Autoanalyzer Mindray BS-300.

Total cholesterol was estimated by cholesterol oxidase - PAP enzymatic photometric method.[13] Triglyceride was estimated by Colorimetric enzymatic test using Glycerol-3-Phosphate Oxidase (GPO) method.[14] HDL-cholesterol was estimated by PolyVinyl Sulfonic acid (PVS) and Polyethylene-Glycol-Methyl Ether (PGME) coupled with classic precipitation method.[15] LDL – Cholesterol and VLDL was calculated by using Friedewald's formula.[13]

During the study period, there was no change in the equipment, reagent, Calibration standards and controls. Before starting the analysis, the instruments were calibrated using calibrators and the controls run at normal concentrations of the analytes. As a part of quality assurance our laboratory is enrolled with CMC, Vellore Tamil Nadu for external quality control and Biorad for Internal Quality control programmes.

3. Results and Discussion

The mean ± SD of Serum TC, TGL, HDL- C, LDL-C and VLDL-C in different age groups of both sexes of healthy subjects is shown in table 1.

Table:1 - Mean values and standard deviation (SD) of serum lipids and lipoproteins in mg/dl

S. No.	AGE (Years)	SEX	TC	TGL	HDL	LDL	VLDL
1	21-40	M(216)	162.5±22.6	94±23.5	40.1±8	103.8±22.2	18.3±4.8
2		F(198)	156.1±20.9	84.8±36.8	44.6±7.7	94.7±19.4	16.7±7.1
3	41-60	M(172)	173.8±24.1	99.6±30.8	41.7±7.4	112.1±26.1	19.9±10.1
4		F(158)	164.5±23.4	92.6±33.1	43.7±8.6	102.3±25.5	18.1±8.7
5	>60	M(134)	181.7±.25.2	106.7±34.3	37.2±6	123.5±20.5	21.2±11.8
6		F(108)	172.8±17.9	101.2±26.4	40.2±4.2	111.9±17	20.6±4.2
7	TOTAL	M(522)	172.7±22.3	100.1±29.5	39.6±7.1	113.1±16.3	19.8±8.9
		F(464)	164.5±21.5	92.9±32.1	42.8±6.8	102.9±20.6	18.5±5.7

As anticipated TC, TGL and LDL levels were lower and HDL levels were higher in 464 female when compared with 522 male of similar age group. Above 60 yrs TC, TGL, LDL levels were increased in female except the HDL, which was found to be decreased; indicating females are also vulnerable to CAD as compared to males beyond 60 yrs.

Reference intervals of lipid profile for 986 healthy subjects were shown in table 2. On side by side comparison of our study data, to the similar studies done in northern India, we hardnosed differences in values[9,10,11] which may be accredited to different diet pattern, physical exercise, education and awareness among the rural population. We advocate that, the reference interval of the current study ought to be taken as pedestal parameters and the clinical assessment should be made on the basis of these findings for Middle East population of Tamil Nadu.

Table 2: Reference Interval of Lipid Profile

S. No.	AGE (Years)	SEX	TC	TGL	HDL	LDL	VLDL
1	21-40	M(216)	131.2±190.6	51.4±113	28.8±56.4	66.8±`126.2	12±26.1
2		F(198)	125.5±186.6	49.7±104.9	35±63.6	65.5±131.8	12.5±27.7
3	41±60	M(172)	135.7±199.4	58.5±133.5	32.4±56.3	72.4±138.7	14.8±29.3
4		F(158)	137.6±195.7	55.2±122.5	37±61.9	70.3±135.1	13.4±28.5
5	>60	M(134)	145.3±205.4	63.5±141.2	35.3±54.2	78.2±140.4	15.5±32.3
6		F(108)	142.4±198.3	60.5±128.5	35.2±58.6	70.6±142.4	13.1±27.5

For predicting the risk factors for CAD, relative ratios of different fractions of plasma lipids along with main parameters are gaining importance to rule out dyslipidemias. Ratios of total cholesterol/HDL, LDL/HDL, TGL x TC\HDL (triad index), TC x TGL x Lp-a / HDL (lipid tetrad index) and TC x TGL x Lp-a x Apo-B/ Apo-AI (lipid pentad index) are emerging predictors of CAD and a high ratio may be a good baton for abnormal cholesterol metabolism.

Of various lipid indices involving HDL, the ratio TC/HDL cholesterol was the strongest forecaster of CAD mortality. Total cholesterol was only weakly positive related to ischemic and total stroke mortality. Kimura et al., instituted that an elevated LDL/HDL ratio may be a positive predictor for coronary lipid-rich plaque and plaque vulnerability in patients with CAD. This prospect is important as the current opinion suggests that plaque that is susceptible to rupture is plaque that is likely to result in an acute myocardial infarction (AMI), while stable plaque may not be hazardous.[16]

Tohidi et al, observed that in diabetic men serum TC/LDL and TC/HDL are reasonable lipid measure to predict CVD. Notably, HDL did not have a protective effect for incident CAD among diabetic population, although among non-diabetics it had a protective effect.[17]

The term “lipid triad” or “atherogenic lipoprotein phenotype” was established to describe a common form of dyslipidemia, characterized by three lipid abnormalities: increased plasma triglyceride levels, decreased HDL-cholesterol concentrations and small, dense LDL particles.[18]

Various ratios deliberated from our study were shown in table 3, LDL/HDL ratio, which was less than 5, is well thought-out to be normal. TGL/HDL ratio of 2.8 – 3.8 was measured normal, as it should be preferably < 4 but if possible < 2. Triad index of < 500 was conscientious to be normal but in the population studied the values were > 500 after the age of 40 in both the sexes. Sophisticated research with large scale population is required to establish any new supplementary points to the uncovering of the present stated values.

Table 3: Different ratios determined from healthy population

S. No.	AGE (Years)	SEX	TGL/HDL	LDL/HDL	TC x TGL/HDL
1	21-40	M(216)	2.81±1.1	2.79±1.2	507.67±274.2
2		F(198)	2.41±0.91	2.15±0.77	412.34±220.08
3	41-60	M(172)	3.65±1.32	2.98±1.18	676.6±284.46
4		F(158)	2.97±1.19	2.68±1.07	536.01±261.96
5	>60	M(134)	3.87±1.36	3.27±1.11	761.3±311.78
6		F(108)	2.85±0.68	3.07±1.08	555.85±234.88

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