Octa Journal of Biosciences
International peer-reviewed journal
Octa. J. Biosci. Vol. 2(1):36-39

ISSN 2321 – 3663
June 2014

Octa Journal of Biosciences

journal homepage: www.sciencebeingjournal.com

Lipids And Lipoprotein Concentrations Among Different Castes of Uttarakhand Population: Need of Population Surveys

G. Awasthi[1] and Nivedita Sheel[2]

1. Department of Biochemistry. Dolphin (PG) Institute of Bio-medical and Natural Science Dehradun. (UK).
2. Chemistry Division, Forest Research Institute, Dehradun(U.K.)

ARTICLE INFO

Received 2 Jan. 2014
Revised 28 March. 2014
Accepted 29 May 2014
Available online 16 Jun. 2014

Keywords:
Lipids, Lipoproteins, Proteins. Mortality, Uttarakhand Populations

Email:gyanendra_kkc@rediffmail.com

ABSTRACT

Asian populations have experienced spurt in chronic diseases later than the western populations. South Asia especially India where infectious diseases are still highly prevalent, has suffered much more after this transition, as the prevalence, incidence and mortality from coronary artery disease (CAD) among them have been reported to be higher than among the western and other Asians. Coronary artery disease (CAD) is a multifactorial disease resulting from interaction among various hereditary, cultural and environment factors. Population specific studies are rare. The present study reports Lipid (total cholesterol and triglycerides), Lipoprotein (HDL, LDL, VLDL) and their concentrations among six Uttarakhand populations and discuss the importance of population surveys covering normal healthy individuals for developing policies for coronary heart diseases (CHD) prevention owing to unique genetic make -up of Indian populations.

INTRODUCTION

In human metabolism, lipids are considered as one of the important dietary constituent. The elevated levels of blood lipids especially cholesterol are the major - factors for heart diseases. Each 1% rise in cholesterol is associated with an approximate 2% increase in coronary heart diseases (CHD). Many epidemiological studies have established that LDL is directly proportional and HDL is inversely proportional to CHD. Hyperlipidaemia and lipoprotenemia are responsible for clinical manifestation of atherosclerosis (Goswami and Bandyopdhyay, 2003). The concentration of blood lipid in an individual or population is modulated overwhelmingly by factors such as social, behavioural, physiological and genetics. It is estimated that over 60% of the variability in serum lipids is genetically determined and most of the variation being due to polygenic influences. Interaction between the later and environmental factors is probably the commonest cause of hyperlipidemia in the general population(Thompson,1990).

CHD is the third largest cause for clinical mortality in India after infectious diseases and tuberculosis. Several researchers revealed that the Indians, because of high serum cholesterol lipoprotein (a), Lp(a), insulin resistance syndrome, vitamin E and vitamin C deficiency and genetic make-up are prone to CHD and diabetes(Bhatnagar et al.,1995). Further, Indians are susceptible to atheroma 15–20 years ahead of the west and they develop atheroma even at lower concentration of lipids than western people (Swamy *et al.*, 1989). So, there is a need to develop guidelines and standards for lipid and lipoprotein concentration based on Indian populations. But we still depend upon western standards to diagnosis hyperlipidemia in clinical manifestation of atherosclerosis. In spite of Indians greater genetic and cultural diversity only few populations are covered until now and data on lipid variation is very scanty. So, keeping this in view, glucose lipid (TC and TG), lipoprotein (HDL, LDL and VLDL) profiles and protein among six Uttarakhand populations are presented.

MATERIALS & METHODS

A sum total of 750 (Males= 510 and Females= 240) individuals aged between 20 and 60 years were selected from six populations viz: Bisht, Bhatt, Joshi, Negi, Pant, and Rawat living in Uttarakhand. 5 ml intravenous blood was drawn from each individual at resting position after overnight fasting in vacutainers. An informed consent was taken from the volunteers. Age, height weight and blood pressure were recorded and food habits of the subjects were obtained using a questionnaire. The past history of each person along with family history was tracked and no cases of M.I were detected. The sample blood of individuals was tested at the Biochemistry laboratory Dolphin(PG) Institute of Biomedical and Natural Science, Manduwala, Dehradun, (Uttarakhand). Serum total cholesterol levels was determined by enzymatic (CHOD-PAP) colorimetric method(Allain *et al.*,1974) and triglycerides by enzymatic

(GPO-PAP) method (Jacobs and VanDenmark, 1960). HDL-cholesterol and LDL-cholesterol were estimated using precipitant (Gordon and Gordon, 1977) and Friedwald formula (Freidwald *et al*. 1972). Lipid Triad Index was calculated using the formula TCXTG/HDL-C (Goswami and Bandopdhyay, 2003). Statistical analyses of data such as range, mean and standard deviation were carried out using MS excel software.

RESULTS & DISCUSSION

The results obtained after the Statistical analysis were presented in Tables 1, 2, 3 and 4. The value of Total Cholesterol was found to be 145.59± 34.08 mg/dl in the studied population. The total cholesterol (TC) varies between 71.65 mg/dl and 236.90 mg/dl. Females recorded the insignificantly higher values (155.09±39.66 mg/dl) as compared to males (147±34.47). Similar observation was also reported in Vishakhapatnam city (Madhavi and Naidu, 2004). Raised values in males as compared to females were reported in population of Calcutta, Gwalior and Amritsar (Goswami and Bandopdhyay, 2003; Chitkara *et al.,* 2007; Sharma *et al*., 2004). The TC was found to be insignificantly highest among Pant (181.23 mg/dl) whereas the Joshi recorded the lowest total cholesterol (138.81mg/dl). Insignificant variation in the values of TC is probably due to the similar lifestyle and genetic makeup of the population of Uttarakhand region.

The total value of Triglyceride was found to be 121.5017±50.02 mg/dl. The mean TG ranges from 26.48 mg/dl to 273.00 mg/dl. The value of Triglyceride was found to be insignificantly highest in case of males (128.48±48.72 mg/dl) as compared to females (114.54±55.34mg/dl). Higher triglyceride in male as compared to female was mostly observed in previous studies (Chitkara et al., 2007; Madhavi and Naidu, 2004). Some populations demonstrated the reverse trend (Goswami and Bandopdhyay, 2003; Sharma *et al.*, 2004).

The Bhatt population exhibited the highest mean TG (158.31 mg/dl) while the lowest was reported among Bisht (95.21 mg/dl).The total value of HDL-Cholesterol was found to be 45.12±4.47 mg/dl. The range of HDL vary from 20.23 mg/dl to 95.65 mg/dl. However if males and females are taken separately, the value of HDL-Cholesterol was found to be slightly high in males (45.17±15.19 mg/dl) as compared to females (45.12±16.57 mg/dl). Similar findings were reported in population of Calcutta, Amritsar and Vishakapatnam city (Goswami and Bandopadhyay, 2003; Sharma et al., 2004; Madhavi and Naidu, 2004). Reddy et al., reported the insignificantly high value in females as compared to males (Reddy et al, 2002). The Bisht recorded the highest mean HDL (48.19 mg/dl) while the Negi recorded the lowest value (40.63 mg/dl).

The total value of LDL-Cholesterol was found to be 80.74±33.31 mg/dl. The LDL Cholesterol ranges from 8.68 mg/dl to 160.00 mg/dl The highest mean LDL Cholesterol recorded among Pant (111.33 mg/dl) The lowest mean of LDL was found among Joshi (68.13 mg/dl) .The value of LDL-Cholesterol was found to be Significantly highest in females (87.17±39.04 mg/dl) as compared to that of males (75.79±34.90 mg/dl). Insignificantly high value in female as compared to male was observed in Gwalior, Vishakhapatnam population (Chitkara et al., 2007; Madhavi and Naidu, 2004). Insignificantly high values in male as compared to female was observed in Amritsar and Andhra population (Sharma *et al*, 2004; Reddy *et al*, 2002)

The VLDL Cholesterol was calculated by formula (Triglyceride/5) and follows the similar trend as that of triglycerides.

Insignificant variation was observed among the genders and different castes in TC/HDL-C ratio this is due to insignificant variation in total Cholesterol and HDL Cholesterol values. Similar observation was recorded in Vishakapatnam city (Madhavi and Naidu, 2004). Pant recorded the highest mean (4.44±1.67) and Bisht recorded the lowest mean (2.97±0.71). As per risk specification the Bisht population are at lowest risk the values are less than half the average(3.43) all the other population lies between half the average (3.43) and the average risk (4.97).

LDL-C/HDL-C values was insignificantly elevated in females(2.26±1.52) as compared to males(1.92±1.16) Among the different castes pant recorded the highest mean(2.83±1.39) and Bisht recorded the lowest mean (1.54±0.64) Similar observation was recorded in Vishakapatnam city(Madhavi and Naidu, 2004).All the population lies between half the avg (1.00) and the avg risk(3.55).

The TG/HDL-C ratio has been related to LDL size patho-physiology and relevant with regard to the risk of clinical vascular disease. A value greater than 1.33 is suggestive of higher percentage of small LDL particles which are more prone to oxidation leading to atheromatous plaque (Goswami and Bandopdyay, 2003). All the castes demonstrate higher mean value as compared to cut off.

Lipid triad Index more than 500 reflects Dyslipidemia (Goswami and Bandopdyay, 2003; Jhala *et al*., 1998; Gupta *et al*., 1997).as per this Index Bhatt population are at highest risk (598±392) followed by pant (598±392). The extent of Dyslipidemia is lowest in Joshi (410±230).

Thus as per the above study most of the lipid parameters vary insignificantly among the different population of Uttarakhand region but lipid triad Index and LDL Cholesterol which are important determinant in the cardiac risk evaluation vary significantly Since life style variation was minimized in this study this variation is probably due to unique genetic make- up of different castes. A study involving larger sample size is required to further evaluate the point.

CONCLUSION

The control and prevention of high lipid levels are central to the prevention of stroke, coronary heart disease, cardiovascular diseases and other lipid associated health hazards. Lipidemia is usually symptomless and remain undiagnosed unless it is tested for. One way of detecting lipidemia is conducting health surveys of populations. The determinants of lipids have been thoroughly explained in western populations. A great number of cross sectional studies of lipid variation in different populations throughout the world have been carried out to corroborate the relationship between lipids and bioenvironmental factors. Based on scientific and clinical data from population studies the United States and United Kingdom have established education programmes like National Cholesterol Education Program, (NCEP) Multiple Risk Factor Intervention Trial (MR FIT), Helsinki Heart Study and International Study Group of the Europeanrosis study. All these education programmes have brought marked decline in the mortality rates from disease such as coronary heart diseases cardiovascular heart diseases, and

Table1: Range and Mean values of Lipid Parameters among Genders in Uttarakhand Population

S.N	Parameters	Male		Female	
		Range	Mean±SD	Range	Mean±SD
1	Total Cholesterol	71.65-228.0	147±34.47	92.12-236.9	153.38±39.66
2	Triglycerides	66.48-233.0	128±48.72	59.20-273.0	112.49±55.34
3	HDL-Cholesterol	25.08-91.00	45.17±15.19	20.23-95.65	45.27±16.57
4	LDL-Cholesterol	84.02-152.66	75.79±34.90	20.00-160.0	85.72±39.04
5	VLDL-Cholesterol	13.2-46.66	25.6±9.6	11.8-54.6	22.4±11.0
6	TC/HDL-C Ratio	1.42-6.96	3.56±1.34	1.54-8.42	3.81±1.70
7	LDL-C/HDL-C Ratio	0.17-4.7	1.92±1.16	0.25-6.87	2.26±1.52
8	TG/HDL-C Ratio	0.59-8.26	3.11±1.63	0.85-5.17	2.59±1.20
9	Lipid Triad Index	71-1622	471±291	113-1269	432 ±288

Table 2: Range and Mean values of Lipid among Uttrakhand Population

	Total Cholesterol		Triglycerides	
Castes	Range	Mean ± SD	Range	Mean ±SD
Bisht	100.86-171.0	140.00±22.74	53.47-170.00	95.21±37.94
Bhatt	92.12-228.0	144.78±40.58	59.36-233.00	158.31±61.60
Joshi	71.65-200.0	138.81±29.84	49.20-198.15	120.54±42.03
Negi	84.00-209.0	154.50±42.94	51.10-190.00	110.93±42.77
Rawat	104.7-195.00	143.75±29.97	54.83-273.0	127.01±60.59
Pant	118.0-236.90	181.23±38.42	26.48-170.14	117.02±45.94

Table 3: Range and Mean values of Lipoproteins among Uttarakhand Population

	HDL		LDL		VLDL	
Castes	Range	Mean ± SD	Range	Mean ± SD	Range	Mean ± SD
Bisht	38.46-58.70	48.19±6.95	30.49-94.40	71.31±22.45	10.70-34.0	19.04±7.58
Bhatt	28.18-74.45	42.70±14.22	8.88-152.66	70.64±39.77	11.87-46.60	31.65±12.35
Joshi	21.25-95.65	46.59±17.34	8.68-138.38	68.13±30.51	9.84-39.63	24.10±8.40
Negi	22.65-74.34	40.63±17.04	18.86-155.76	91.68±40.46	10.22-38.00	20.05±8.41
Rawat	30.12-91.0	46.97±18.59	42.40-134.28	71.36±27.55	10.90-54.74	25.40±12.16
Pant	20.23-84.70	45.97±17.57	30.89-160.0	111.33±39.25	5.30-34.00	22.21±9.18

Table 4: Range and Mean values of Lipid ratios and Index among Uttarakhand Population

	Total Chol/HDL-C		LDL/HDL-C		Trig/HDL-C		Lipid Triad Index	
Castes	Range	Mean ± SD	Range	Mean ± SD	Range	Mean ± SD	Range	Mean ± SD
Bisht	1.84-3.78	2.97±0.71	0.56-2.38	1.54±0.64	1.24-3.32	1.94±0.68	148-538	285±136
Bhatt	1.73-6.96	3.70±1.49	0.18-4.31	1.91±1.27	1.70-8.26	3.97±1.92	179-1622	598±392
Joshi	1.42-6.45	3.32±1.33	0.17-4.60	1.86±1.29	0.99-6.53	2.90±1.49	91-1058	410±230
Negi	1.75-8.42	4.35±2.24	0.39-6.87	2.71±1.91	0.85-6.29	3.20±1.69	121-807	488±263
Rawat	1.68-4.45	3.30±0.88	0.46-3.03	1.72±0.80	1.07-5.12	2.91±1.31	164-999	416±234
Pant	2.18-7.46	4.44±1.67	0.51-4.8	2.83±1.39	0.59-4.64	2.42±1.01	71-1269	540±344

stroke attributable to lipids and signify the application of research and science to public policy.

In India, systematic epidemiological studies of lipid profiles among populations are limited. It is important to know the concentrations of lipids in Indian populations in order to estimate the number of persons who need detection , treatment and to formulate intervention programs by the government. And, there is need for the detection of risk factors of several health problems and to develop and evaluate the low cost methods of effective treatment in India. Many researchers emphasized that in India there is a need to organise a community based program for identifying individuals with elevated lipids and bring them into medical facilities for further evaluation and maintaining a high proportion of them in a long term control program. To diagnose coronary heart disease, we depend on standards which are based on American and European populations. So, there is need to develop standards in India because of unique genetic background of Indian populations.

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