Isolated Lipid Abnormalities in Rural and Urban Normotensive and Hypertensive North-West Indians

P Malhotra, Savita Kumari, S Singh, S Varma

Abstract

Background: Lipid abnormalities are common in patients with hypertension. The prevalence of isolated lipid abnormalities is not known in normotensive and hypertensive population of north-west India.

Methods: We studied the prevalence of isolated low high density lipoprotein cholesterol (IL-HDLC), isolated high low density lipoprotein cholesterol (IH-LDLC) and isolated high triglycerides (IH-TG) abnormalities among rural and urban normotensive and hypertensives of north-west India.

Results: The prevalence of lipid abnormalities was 47.6% and 51.4% in rural normotensives and hypertensives and 43.8% and 46.8% in urban normotensives and hypertensives respectively. The prevalence of IL-HDLC varied from 3.8% to 23.7% among hypertensives and 19.4% to 30.4% among normotensives. The prevalence of IH-TG abnormalities was 11.8% to 18.8% among hypertensives and 7.0% to 15.4% among hypertensives. The prevalence of isolated high LDLC abnormalities was low (0.8-9.2%). There was no significant difference in these abnormalities in relation to age and sex except IH-LDLC in male hypertensives.

Conclusion: Isolated low HDLC and isolated high TG were the commonest isolated lipid abnormalities among rural and urban population of north-west India whereas isolated high LDLC was uncommon.

INTRODUCTION

Hypertension is an emerging health problem in India.1-4 It is a cardinal risk factor for coronary artery disease (CAD) and the risk of CAD further increases in presence of dyslipidemia.5 Both hypertension and dyslipidemia coexist more often than by a chance alone.6 Out of different fractions of lipoproteins, low density lipoprotein cholesterol (LDLC) is considered as the most important risk factor for CAD.7 Asian Indians have a high prevalence of CAD and the risk factors are still not clear.8 Various studies on lipids in Asian Indians have shown a mixed picture of dyslipidemia. Studies among immigrant Indians have shown high triglycerides (TG) and low high density lipoprotein cholesterol (HDLC) as the most common lipid abnormalities.8 Studies from north-west India have shown high total cholesterol (TC), high TG and low HDLC as the predominant abnormalities in normal as well as among hypertensive population.10-15 Studies from southern India have shown lipid abnormalities predominantly of TC, LDLG and TG rather than low HDLC.16-19 However, the information on prevalence of these isolated lipid abnormalities from the region is scanty.20 The study was undertaken to find the prevalence of these isolated lipid abnormalities in normal and hypertensive rural and urban population of north-west India.

MATERIAL AND METHODS

Fasting blood for lipids and blood sugar was collected from newly diagnosed adult hypertensives attending the Hypertension Clinic of Nehru Hospital attached to Post Graduate Institute of Medical Education and Research, Chandigarh. The age range was 18-85 years with median of 45 years. The hypertension was diagnosed based on JNC VI criteria, i.e. systolic blood pressure ≥ 140 mm of Hg and or diastolic blood pressure ≥ 90 mm of Hg. Individuals with secondary hypertension, diabetes, renal failure, stroke and other systemic illnesses were excluded from the study. Type 2 diabetes was excluded if the fasting blood sugar was ≥ 126 mg/dL. Post-prandial blood sugar was not done. The control group comprised of normotensive individuals from rural areas near Chandigarh and healthy normotensive attendants of patients admitted to the hospital. All the individuals in control group underwent general physical examination to rule out any systemic illness. A total of 488 blood samples were analysed from March 1998 to February 2000. This comprised 488 rural subjects (247 males, 241 females) and 500 urban subjects (341 males, 159 females). Height was recorded by
standard anthropometer with the subject standing without shoes. Weight was recorded on beam scale in minimal clothing. Body mass index was calculated from weight (kg) divided by square of height in meters. Total cholesterol (TC), TG and HDL-C were measured by commercially available standard enzymatic kit (Accurex Biomedical, Thane, India). Measurement were performed on an automated analyser (Ames Seac CH-100). The intra-assay variation of total cholesterol, triglycerides and HDL was less than 10%. The LDLC levels were derived by Freidewald’s formula \[LDL \text{ cholesterol} = TC - (HDL + TG/5)\].

Dyslipidemias were diagnosed as per the guidelines of United States National Cholesterol Education Program (NCEP). Normal lipid profile was defined if LDLC was less than 160 mg/dl, HDLC ≥ 35 mg/dl and TG less than 200 mg/dl. Isolated low HDLC (IL-HDLC) was defined if levels of HDLC were less than 35 mg/dl, LDLC less than 160 mg/dl and TG less than 200 mg/dl. Isolated high LDL (IL-LDLC) was defined if the LDLC was ≥ 160 mg/dl, TG less than 200 mg/dl, HDLC ≥ 35 mg/dl. Isolated high TG (IH-TG) was defined if the TG was ≥ 200 mg/dl, LDLC less than 160 mg/dl, HDLC ≥ 35 mg/dl.

Statistical Analysis

Student’s t test was used to analyse quantitative variables and Chi square for qualitative variables. Statistics were carried out on SPSS statistical package (SPSS ver 5.02 Inc, Chicago, USA). A p value of <0.05 was considered as significant.

**Results**

The rural population consisted of 181 hypertensives (M/F; 76/105) and 307 normotensives (M/F; 171/136) whereas
urban population comprised of 235 hypertensives (M/F; 155/80) and 265 normotensives (M/F; 186/79). Body mass index (BMI) and lipids were not normally distributed and were transformed to either log or log (x-a) where constant ‘a’ was added so that skewness of transformed variables was close to zero.\textsuperscript{23} The mean age and BMI were significantly higher among hypertensives as compared to normotensives (Table 1). The most common isolated lipid abnormality was found to be IL-HDLC (Table 2). The prevalence of IL-HDLC was highest among rural normotensive population (27.7%) with males having higher prevalence (30.4%) than females (24.3%). The urban hypertensives had lowest prevalence of IL-HDLC abnormality (males 17.4%, female 3.8%, \( p < 0.05 \)). The prevalence of IH-LDLC was 0-1.5% among normotensives and was higher among both rural and urban hypertensives (4.5% and 9.2%, Table 2). IH-TG abnormalities were higher among both rural and urban hypertensives (11.8% and 18.8%) whereas in normotensives it was 7% and 15.4% respectively. Age and sex related pattern of dyslipidemia in normotensive subjects

<table>
<thead>
<tr>
<th>Age groups</th>
<th>Normal lipids</th>
<th>Combined dyslipidemia</th>
<th>IL-HDLC</th>
<th>IH-LDLC</th>
<th>IH-TG</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-30</td>
<td>M/F</td>
<td>N (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>IL (%)</td>
</tr>
<tr>
<td>(133)</td>
<td>(90/43)</td>
<td>48 (58.3)</td>
<td>37 (48.1)</td>
<td>24 (55.8)</td>
<td>0</td>
</tr>
<tr>
<td>31-45</td>
<td>(200)</td>
<td>72 (35.5)</td>
<td>33 (49.3)</td>
<td>37 (58.5)</td>
<td>1 (0.8)</td>
</tr>
<tr>
<td>(176)</td>
<td>(109/67)</td>
<td>65 (59.6)</td>
<td>16 (57.1)</td>
<td>65 (59.6)</td>
<td>1 (0.9)</td>
</tr>
<tr>
<td>&gt; 60</td>
<td>(63)</td>
<td>15 (42.9)</td>
<td>16 (57.1)</td>
<td>24 (55.8)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 (2.9)</td>
<td>1 (2.9)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td>0</td>
<td>0</td>
<td>-</td>
</tr>
</tbody>
</table>

Normal = HDL $\geq$ 35 mg/dl; LDL $< 160$ mg/dl; TG $< 200$ mg/dl; IL-HLC (Isolated low high density lipoprotein cholesterol) = HDLC $< 35$ mg/dl, LDLC $< 160$ mg/dl, TG $< 200$ mg/dl; IH-LDLC (Isolated high low density lipoprotein cholesterol) = HDLC $\geq 35$ mg/dl, LDLC $\geq 160$ mg/dl, TG $< 200$ mg/dl; IH-TG (Isolated high tryglycerides) = HDLC $\geq 35$ mg/dl, LDLC $< 160$ mg/dl, TG $< 200$ mg/dl; Combined dyslipidemia = HDLC $< 35$ mg/dl and LDLC $\geq 160$ mg/dl and TG $< 200$ mg/dl

Table 3: Age and sex related pattern of dyslipidemia in hypertensive subjects

<table>
<thead>
<tr>
<th>Age groups</th>
<th>Normal lipids</th>
<th>Combined dyslipidemia</th>
<th>IL-HDLC</th>
<th>IH-LDLC</th>
<th>IH-TG</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-30</td>
<td>M/F</td>
<td>N (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>IL (%)</td>
</tr>
<tr>
<td>(34)</td>
<td>(17/17)</td>
<td>11 (64.7)</td>
<td>37 (62.7)</td>
<td>3 (4.2)</td>
<td>0</td>
</tr>
<tr>
<td>31-45</td>
<td>(131)</td>
<td>34 (47.2)</td>
<td>41 (67.2)</td>
<td>3 (4.2)</td>
<td>0</td>
</tr>
<tr>
<td>(195)</td>
<td>(110/85)</td>
<td>47 (42.7)</td>
<td>12 (17.9)</td>
<td>1 (1.2)</td>
<td>0</td>
</tr>
<tr>
<td>&gt; 60</td>
<td>(56)</td>
<td>18 (56.3)</td>
<td>12 (17.9)</td>
<td>1 (1.2)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td>1 (1.2)</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td>3 (10.9)</td>
<td>1 (1.4)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td>2 (3.4)</td>
<td>9 (10.6)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td>1 (1.4)</td>
<td>1 (1.4)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td>2 (3.4)</td>
<td>9 (10.6)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td>1 (1.4)</td>
<td>1 (1.4)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td>2 (3.4)</td>
<td>9 (10.6)</td>
<td>0</td>
</tr>
</tbody>
</table>

Normal = HDL $\geq 35$ mg/dl; LDL $< 160$ mg/dl; TG $< 200$ mg/dl; IL-HLC (Isolated low high density lipoprotein cholesterol) = HDLC $< 35$ mg/dl, LDLC $< 160$ mg/dl, TG $< 200$ mg/dl; IH-LDLC (Isolated high low density lipoprotein cholesterol) = HDLC $\geq 35$ mg/dl, LDLC $\geq 160$ mg/dl, TG $< 200$ mg/dl; IH-TG (Isolated high tryglycerides) = HDLC $\geq 35$ mg/dl, LDLC $< 160$ mg/dl, TG $< 200$ mg/dl; Combined dyslipidemia = HDLC $< 35$ mg/dl and LDLC $\geq 160$ mg/dl and TG $< 200$ mg/dl; *\( p < 0.05 \)
is shown in Tables 3 and 4 respectively. There was no significant difference in isolated lipid abnormalities among various age and sex groups except IH-LDLC abnormalities among male hypertensives (Table 4).

**DISCUSSION**

The present study shows that the prevalence of dyslipidaemia is in the range of 45-50% in normotensives and hypertensives in north-west India. The most common lipid abnormality was isolated low HDL cholesterol. The prevalence was highest among rural normotensives (27.7%) followed by rural hypertensive population (21.5%). The prevalence of this lipid abnormality was lowest in urban hypertensive population (12.8%). Though other population based studies have not looked at the prevalence of isolated low HDLC, the studies from Rajasthan and Delhi show that there is high prevalence of low HDL cholesterol, however, these studies have not looked specifically at isolated low density HDL cholesterol. The present study shows that north-west Indians have isolated low HDL cholesterol as the most common lipoprotein abnormality.

The second isolated lipid abnormality was isolated high TG. The proposed mechanisms of these lipid abnormalities are likely to be due to hyperinsulinemia known as syndrome X. Syndrome X is known to predispose hypertensive individuals to higher risk of CAD. A recent study in type 2 diabetics from south India showed that isolated high TC, LDLC and low HDLC are the commonest isolated lipid abnormalities in them. However, such information is not available for nondiabetic hypertensive population from India.

The common causes of low HDL cholesterol are carbohydrate-rich diet, smoking and sedentary activity. Though the physical activity is higher among rural population, they have higher prevalence of smoking and their diet is rich in carbohydrates with low fat content. The urban population on the other hand consumes high fat diet which is known to increase the LDLC levels. The other confounding factors can be alcohol consumption and smoking. However, these factors were not studied in the present study. There is need to do more studies on lipids among different populations to find out abnormalities taking above factors into consideration as these observations and the findings may have therapeutic implications.

**REFERENCES**


---

**Announcement**

**AWARD SESSIONS**

1. Dr. DP Basu Young Award in Cardiology
2. E Merck Award
3. Dr. JN Berry Memorial Award and
4. Dr. MJ Shah Memorial Award in Tropical Medicine

There will be four award sessions at the 2004 Annual Conference of API at Hyderabad. The rule and regulations of these awards are as under:

1. Papers that are accepted for presentation in the Award Session at the Annual Conference will be divided subject-wise into four groups:

   **GROUP I** CARDIOLOGY                     **GROUP II** CHEST DISEASES
   **GROUP III** OTHER SPECIALITIES           **GROUP IV** TROPICAL MEDICINE

   The Award of Dr. JN Berry Memorial Award and E. Merck Award are given in alternate years in Group II and III papers. At the 2004 Annual Conference at Hyderabad, Dr. JN Berry Memorial Award will be for ‘Other Specialities’ and E Merck Award for ‘Chest Diseases’. Dr. DP Basu Young Ward will be for ‘Cardiology’ and Dr. M. J. Shah Memorial Award for ‘Tropical Medicine’.

2. The competitor must be the first author of the paper submitted for presentation at the API sessions of the Annual Conference. A testimonial must be submitted from the Head of the institution that the major work has been done by the competitor. Papers which are previously presented or published will not be considered. The competitor should also give a written pledge stating that the work has not been presented or published before. He should be a member of API.

3. Dr. JN Berry Memorial and DP Basu Young Awards are worth Rs. 1000/- each. E Merck Award Rs. 2000/- and Dr. MJ Shah Memorial Award is worth Rs. 2500/-. 

4. The upper age list of the competitor is 40 years.

5. The decision will be taken by a panel of judges appointed by the Governing Body of API.

6. The candidate must apply for the award and full manuscript of the paper will have to be submitted. The paper will be presented in separate award session.

7. Eight copies of full manuscript will have to be submitted to Dr. (Maj. Gen.) S. Venkataraman, President - Elect and Chairman Scientific Committee, APICON 2004, Flat No.137, Air Force & Naval Officers Enclave, Plot No.11, Sector - 7, Papan Kalan, Dwarka, New Delhi - 110 045 of API by 31st July, 2003. One copy of the paper should be sent to Dr. Sandhya Kamath, Hon. General Secretary of API at Mumbai.

8. The decision of the panel judges will be final and binding to all concerned.

**PRESTIGIOUS AWARDS OF API**

1. GIFTED TEACHER (2003)
2. DISTINGUISHED MEMBER (2003)

Laud Mansion, 3rd Floor Maharshi Karve Road  
Mumbai 400 004. Tel (022) 382 9348 Fax : 389 5297  
Dr. Sandhya Kamath, Hon. General Secretary, API