Lipid Profiles Among Diverse Ethnic Groups in Indonesia

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ABSTRACT

Aim: to describe the differences in plasma lipid profiles of 4 (four) Indonesian ethnic groups, i.e., Minangkabau, Sundanese, Javanese and Buginese.

Methods: this cross sectional population study was consisted of adults aged 18 years and older. Lipid profile was assessed by collecting fasting blood samples among all the four ethnic groups. Sub samples of those 4 groups of ethnicity were randomly selected from a total sample respondents from Padang, Bandung, Yogyakarta and Makasar, according to sample size requirement. The required sample size was from 150 to 300 respondents. Interview was used to collect personal identity, general information and socio-economic data of the respondents. Lipid profile was assessed by using two methods: The first method of assessing lipid profile was carried out in each Regional Health Office laboratory, while the second method of assessing lipid profile was carried out in Wageningen, Netherlands. The result of lipid profiles using these two methods were analyzed using paired t-test. Data entry, processing and analyses were performed using EPI-INFO program (version 6), Statistical Package for Social Science (SPSS) for Windows version 10.0.

Results: Minangkabau ethnic women, aged more than 40 years old had the highest mean plasma total cholesterol (209.77 mg/dl) and LDL cholesterol (146.02 mg/dl) and the highest proportion of prevalence dyslipidemia based on category risk level of total and LDL cholesterol. Based on HDL plasma cholesterol risk level, they were among all the four ethnic groups. Sundanese ethnic men, less than 40 years old have the lowest mean plasma HDL cholesterol (36.79 mg/dl) and have highest proportion of dyslipidemia.

Conclusion: older group of Minangkabau ethnic women have higher risk toward dyslipidemia based on plasma total and LDL cholesterol and younger group of Sundanese ethnic men have probability toward risk of dyslipidemia based on HDL level.

Key words: ethnic, plasma total, LDL, HDL cholesterol, dyslipidemia.

INTRODUCTION

Cardiovascular disease (CVD) mortality appears to be more common in communities with high risk factors for heart disease. Epidemiological studies have identified people who are at greater risk of developing coronary heart disease (CHD).1 Risk factors for CHD have important statistical associations with future CHD events and also have direct causal linkages with atherosclerosis and CHD. Modifiable risk factors for CHD among others are hypercholesterolemia, hypertension, smoking, obesity, physical inactivity, and diabetes. The Framingham study is one of the first epidemiological studies which described risk factors of CHD. Over 20 epidemiological prospective studies in at least 14 countries, considering the diversity of the population and differences in their methodology, have shown that high plasma low-density lipoprotein (LDL) or total cholesterol, arterial hypertension and cigarette smoking are the three major risk factors for CHD.2-6 Hypercholesterolemia is important, because it is the only risk factor that by itself can cause atherosclerosis. Total serum cholesterol appears to be the most important determinant of the geographic variation in the distribution of the CHD. Many population studies have established the relationship of plasma cholesterol with the incidence of CHD.2,3 Epidemiological study in human, such as Multiple Risk Factor Intervention Trial (MRFIT) has shown a significant strong correlation between plasma cholesterol levels and CHD death rates. Some clinical trials showed that a 1% reduction in total cholesterol level has been associated on average with a 2-3% decrease in the incidence of CHD events.2-4

Indonesian Family Health Survey or Survei Kesehatan Rumah Tangga (SKRT) in 1986 showed that cardiovascular disease was the 3rd cause of death. Subsequent report in 1992 and also 1995 SKRT report, cardiovascular disease has become the primary cause.
of death. SKRT in 1992 reported CVD as the first rank in the cause of death i.e. 16.5% of all causes of death while based on SKRT in 1995 the percentage was increasing. The proportion of CVD as all causes of death became 24.2% especially in Java and Bali. Although infectious diseases are still the primary cause of death in Indonesian islands other than Java and Bali, recent data demonstrated that the proportion of CVD as all causes of death is escalating. Based on recent report of National Basic Health Research 2007 (RISKESDAS) prevalence of CVD was the highest among the non communicable diseases. Results of the MONICA (Monitoring Trends and Determinant in Cardiovascular Disease Survey) study of the population among the age group of 25 to 64 years old in Jakarta showed that the prevalence of hypercholesterolemia was increased from 13.4% in 1988 to 16.4% in 1993.

Ethnic differences in the incidence and prevalence of CVD have also been well documented. Available data showed that the proportion of inpatients with cardiovascular disease in West Sumatera province was the highest among 30 provinces in Indonesia namely 4.0%, while the proportion in West Java and Yogyakarta provinces was around 1.9-2.1% and in South Sulawesi province was even lower, approximately 0.9%. Minangkabau ethnic group belongs to the ethnicity that mostly live in West Sumatera province and Sundanese ethnic is the ethnicity that mostly live in West Java province. Javanese ethnic mostly live in Central Java province and Yogyakarta. While Buginese ethnic mostly live in South Sulawesi province.

METHODS

This was a cross-sectional study on adult aged 18 years old and over who lived in 4 cities namely Padang, Bandung, Yogyakarta and Makasar and those who were of Minangkabau, Sundanese, Javanese and Buginese ethnicity. Ethnicity was defined according to the ethnicity of the parents. At least both mother and father of the respondent were from the same ethnicity with no mixed marriage. The information concerning the ethnicity of the respondent and the parents was achieved through self-perceived definition. This study was the sub sample of “body mass index survey” cities in Indonesia. It was conducted within the collaboration between The Nutrition Directorate, Ministry of Health Republic of Indonesia and Faculty of Public Health University of Indonesia. Sub sample of those 4 groups of ethnicity were randomly selected from total sample respondents from Padang, Bandung, Yogyakarta and Makasar, according to sample size requirement. The required sample size was from 150 to 300 respondents.

Interview was used to collect personal identity, general information and socio-economic data of the respondents. Blood samples were collected to assess lipid profile consisting of: total cholesterol, low-density lipoprotein cholesterol (LDL-C) and high-density lipoprotein cholesterol (HDL-C). Blood had been collected from each respondent in the morning after a fasting period of 10–12 hours. Lipid profile was assessed by using two methods: The first method of assessing lipid profile was carried out in each Regional Health Office laboratory, while the second method of assessing lipid profile was carried out in Wageningen, Netherlands. The result of lipid profiles using these two methods were analyzed using paired t-test. It was shown that there were no significant differences between the two methods.

Data entry, processing and analyses were performed using EPI-INFO program (version 6), Statistical Package for Social Science (SPSS) for Windows version 10.0.

RESULTS

General Characteristics of The Study Population

About 60% of the study populations were women with the mean age ranged from 31.8 to 44.8 years old. The men were significantly older than the women. There were differences in educational attainment between men and women among all the four ethnic groups. Men were more educated than women. There were differences in occupational status between men and women among the four ethnic groups of all the study population. It was shown that most of women, approximately more than 50% of Minangkabau, Sundanese, Javanese and Buginese women in these study population were not working. Most of the study populations were married.

Lipid Profiles Among Ethnic Groups

Minangkabau ethnic had the highest values of mean plasma total cholesterol (209.77mg/dl) and LDL cholesterol levels (146.02mg/dl). On the other hand the Sundanese ethnic had the lowest mean plasma HDL
Prevalence of dyslipidemia based on plasma total cholesterol >240 mg/dl showed that Minangkabau ethnic had the highest proportion (24.8%). (Figure 1) It was also shown that Minangkabau ethnic had the highest proportion (33.9%) compared to the other three ethnics based on LDL cholesterol >160 mg/dl as a dyslipidemic indicator. (Figure 2) While if prevalence of dyslipidemia was based on plasma HDL cholesterol <35 mg/dl, Sundanese ethnic had the highest proportion (48.9%). (Figure 3)

Lipid Profiles Among Ethnic Groups by Gender

Among the four ethnic groups, women had higher mean plasma total cholesterol compared to men. It was significantly different higher in women compared to men, especially among Minangkabau and Sundanese ethnics (Figure 4). Mean LDL cholesterol among the four ethnic groups showed also similar significantly different higher in women compared to men (Figure 5). Based on mean plasma HDL cholesterol, men had much lower mean plasma HDL cholesterol concentrations than women, among the four ethnics. (Figure 6)

Prevalence of dyslipidemia based on plasma total cholesterol >240 mg/dl showed that among the four ethnic, women had higher proportion compared to men. Minangkabau ethnic women had the highest proportion and Sundanese ethnic men had the lowest proportion of dyslipidemia. Prevalence of dyslipidemia based on LDL cholesterol >160 mg/dl showed also higher proportion in women compared to men among three ethnic goups, Minangkabau, Sundanese and Javanese. The highest proportion was also among Minangkabau ethnic women and the lowest proportion was also among the Sundanese ethnic men. Among the Buginese, the proportion was higher in men. However when dyslipidemic indicator was based on plasma HDL cholesterol <35 mg/dl, it was shown that men had higher proportion compared to women, among all the four ethnic groups. The highest proportion was among Sundanese ethnic men and the lowest proportion was among Javanese ethnic women. (Table 2)

There were significant differences in mean plasma total cholesterol, plasma LDL cholesterol and HDL cholesterol concentrations in all the four ethnics between men and women and between less than 40 years old and more than 40 years old subjects. Older women and older men tended to have higher mean plasma total cholesterol and LDL cholesterol concentrations than their younger counterparts in the four ethnics. Younger men had the lowest mean plasma total and LDL cholesterol and older women had the highest mean plasma total and LDL cholesterol among the four ethnics. (Figure 7, Table 4-5)

Younger Sundanese and Javanese men had lower mean plasma HDL cholesterol concentrations than women at the younger and older age group. Men among the older age group of Minangkabau and Sundanese

<table>
<thead>
<tr>
<th>Lipid variables</th>
<th>Minangkabau (n=297)</th>
<th>Sundanese (n=323)</th>
<th>Javanese (n=222)</th>
<th>Buginese (n=171)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plasma total cholesterol (mg/dl)</td>
<td>209.77 (204.74 – 214.73)</td>
<td>181.54 (176.92 – 186.15)</td>
<td>188.58 (183.33 – 193.84)</td>
<td>192.27 (185.23 – 199.33)</td>
</tr>
<tr>
<td>Plasma LDL cholesterol (mg/dl)</td>
<td>146.02 (141.41 – 150.62)</td>
<td>122.97 (118.86 – 127.09)</td>
<td>119.74 (115.24 – 124.24)</td>
<td>130.11 (123.25 – 136.96)</td>
</tr>
<tr>
<td>Plasma HDL Cholesterol (mg/dl)</td>
<td>46.43 (45.02 – 47.86)</td>
<td>36.79 (35.67 – 37.92)</td>
<td>49.18 (47.53 – 50.82)</td>
<td>41.94 (40.21 – 43.67)</td>
</tr>
</tbody>
</table>

Table 1. Mean plasma total cholesterol and LDL, HDL cholesterol among ethnicity.
Figure 1. Prevalence of dyslipidemia based on plasma total cholesterol risk category among four ethnic groups

Low = plasma total cholesterol < 200 mg/dl
Moderate = plasma total cholesterol 200 - 239 mg/dl
High = plasma total cholesterol > 240 mg/dl

Figure 2. Prevalence of dyslipidemia based on plasma LDL cholesterol risk category among four ethnic groups

Low = plasma LDL cholesterol < 130 mg/dl
Moderate = plasma LDL cholesterol 130 - 159 mg/dl
High = plasma LDL cholesterol > 160 mg/dl

Figure 3. Prevalence of dyslipidemia based on plasma HDL cholesterol risk category among four ethnic groups

Low = plasma HDL cholesterol > 45 mg/dl
Moderate = plasma HDL cholesterol 35 - 45 mg/dl
High = plasma HDL cholesterol < 35 mg/dl

Figure 4. Mean plasma total cholesterol concentrations among four ethnic groups by gender

Figure 5. Mean plasma LDL cholesterol concentrations among four ethnic groups by gender

Figure 6. Mean plasma HDL cholesterol concentrations among four ethnic groups by gender
ethnics had lower mean plasma HDL cholesterol concentrations than women with the younger and older age group. (Figure 8, Table 6)

**DISCUSSION**

Mean plasma total cholesterol, LDL and HDL cholesterol of the four ethnic groups were within the normal ranges of lipid profiles; however, there were significant differences of those lipid profiles in ethnicity. Minangkabau ethnic group had the highest mean plasma total cholesterol and LDL cholesterol. Among all the four ethnic groups it was obvious, that women had higher mean plasma total cholesterol and LDL cholesterol compared to men, especially among Minangkabau ethnic women. Based on the category of lipid profiles toward risk of CHD, it was shown also that Minangkabau ethnic women had the highest proportion of those who were with high risk toward CHD. By comparing based on the age group less or
more than 40 years old, it was shown that the older groups had higher mean plasma total cholesterol and LDL cholesterol. The highest mean plasma total and LDL cholesterol among the four ethnic groups was in the Minangkabau ethnic older women.

In term of HDL cholesterol, among the four ethnic groups Sundanese ethnic men had the lowest mean of HDL cholesterol. Based on the age group the lowest mean HDL cholesterol were among Sundanese men who were less than 40 years old. Based on the category of HDL as a dyslipidemic indicator, it was shown also that Sundanese ethnic had the highest proportion. Prospective studies in several countries demonstrated a strong inverse association between CHD and HDL cholesterol. Low level of HDL cholesterol was established as an important coronary risk predictor. Levels of HDL cholesterol were influenced by a variety of biologic, environmental and behavioral characteristics. Exercise and consumption of ethanol might increase HDL, while obesity and smoking might lower the HDL. Vegetarians and those who consumed high carbohydrate, low fat diets, with high ratio of polyunsaturated to saturated fatty acid often tend to have relatively low levels of both LDL and HDL cholesterol. In this case the overall coronary risk might be low.3,6,7,18-21

### Table 4. Mean plasma total cholesterol concentrations among Minangkabau, Sundanese, Javanese and Buginese ethnic groups by gender and age group

<table>
<thead>
<tr>
<th>Ethnicities</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age &lt; 40</td>
<td>Age ≥ 40</td>
</tr>
<tr>
<td></td>
<td>(n=141)</td>
<td>(n=180)</td>
</tr>
<tr>
<td>Minangkabau***</td>
<td>180.23*</td>
<td>199.54*</td>
</tr>
<tr>
<td></td>
<td>(165.04-195.43)</td>
<td>(188.07-210.98)</td>
</tr>
<tr>
<td>Sundanese***</td>
<td>151.84*</td>
<td>183.76*</td>
</tr>
<tr>
<td></td>
<td>(142.89-160.77)</td>
<td>(175.29-192.22)</td>
</tr>
<tr>
<td>Javanese***</td>
<td>158.26*</td>
<td>201.32*</td>
</tr>
<tr>
<td></td>
<td>(145.85-170.66)</td>
<td>(190.02-212.63)</td>
</tr>
<tr>
<td>Buginese***</td>
<td>178.54*</td>
<td>211.38*</td>
</tr>
<tr>
<td></td>
<td>(162.71-194.38)</td>
<td>(181.65-214.12)</td>
</tr>
</tbody>
</table>

*Significant difference between men age < 40 & men age ≥ 40

### Table 5. Mean plasma LDL cholesterol concentrations among Minangkabau, Sundanese, Javanese and Buginese ethnic groups by gender and age group

<table>
<thead>
<tr>
<th>Ethnicities</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age &lt; 40</td>
<td>Age ≥ 40</td>
</tr>
<tr>
<td></td>
<td>(n=141)</td>
<td>(n=180)</td>
</tr>
<tr>
<td>Minangkabau***</td>
<td>122.06*</td>
<td>139.13</td>
</tr>
<tr>
<td></td>
<td>(109.04-135.09)</td>
<td>(128.24-150.02)</td>
</tr>
<tr>
<td>Sundanese***</td>
<td>101.18*</td>
<td>124.03*</td>
</tr>
<tr>
<td></td>
<td>(93.65-108.71)</td>
<td>(116.05-132.01)</td>
</tr>
<tr>
<td>Javanese***</td>
<td>95.75*</td>
<td>130.92*</td>
</tr>
<tr>
<td></td>
<td>(82.32-109.17)</td>
<td>(121.49-140.34)</td>
</tr>
<tr>
<td>Buginese***</td>
<td>121.05*</td>
<td>144.07*</td>
</tr>
<tr>
<td></td>
<td>(105.49-138.61)</td>
<td>(112.71-175.43)</td>
</tr>
</tbody>
</table>

*Significant difference between men age < 40 & men age ≥ 40

** Value in brackets are 95% CI (Confidence Interval) * p < 0.05 ** p < 0.01 *** p < 0.001
several conditions that might lower their HDL level. Among all the four ethnics, Sundanese had the highest proportion of those who were overweight (BMI >25 kg/m²) and those who were smoker. In terms of nutrient intake, Sundanese had highest total energy and carbohydrate as well as P/S ratio. All of these conditions might explain why Sundanese had lower HDL compared to the other three ethnics.

CONCLUSION

Based on analyzing these lipid profiles especially plasma total and LDL cholesterol among the four ethnic groups, we could consider that being Minangkabau ethnic women, more than 40 years old; might have more probability risk toward dyslipidemia. While based on category level of HDL cholesterol, among the four ethnic groups, we could consider that being Sundanese ethnic men, less than 40 years old might also have more probability risk toward dyslipidemia.

REFERENCES


