Original Article

Characteristics of Hyperlipidemia in 1180 Subjects Examined with an Early CVA-detection Program in an Oriental Hospital

Seong-Hwan Choi, Chang-Gue Son, Mun-Won Chang,
Hyun-Kyung Cho, Yoon-Sik Kim, In-Chan Seol*

Department of Internal Medicine of Oriental Medicine College, Daejeon University

Objective: Hyperlipidemia is a main risk factor of stroke and cardiovascular disease. This study aimed to investigate characteristics of hyperlipidemia in adult subjects.

Methods: Hyperlipidemia-related makers were analyzed using biochemical data from 1,180 (496 male and 684 female) subjects who took medical examination in an Oriental Hospital for the purpose of detecting cerebrovascular accident.

Results: 19.7 % of subjects (male 14.7 %, female 23.2 %) had hypercholesterolemia while 21.9 % (male 25.8 %, female 19.0 %) had hypertriglyceridemia. 17.2 % of subjects (male 22.1 %, female 13.6 %) showed low HDL-cholesterol while 13.0% (male 10.3 %, female 14.9 %) showed high LDL-cholesterol.

Conclusions: This study will provide helpful information for patients with hyperlipidemia and to develop therapeutics using traditional Korean medicine.

Key Words : Hyperlipidemia, Cholesterol, Triglyceride, Traditional Korean Medicine

Introduction

Hyperlipidemia is described as the state of excessive fatty substances such as cholesterol or triglyceride in the blood stream, seen as an important risk factor in development of heart disease and stroke[1,2]. Hyperlipidemia is growing very prevalent along with the progress of an aging society, so this lipid disorder has become an important medical issue[3,4]. The high prevalence and the medical importance of hyperlipidemia have made lipid-lowering agents among the best-selling drugs in the world market[5].

Since the first survey study on the prevalence of hyperlipidemia in 1991[6], there have been many epidemiological studies of it in Korea. Their results have consistently shown an increasing pattern of lipid levels and population suffering from this disorder[7,8]. The distribution of hyperlipidemia differs somewhat according to the character of subjects surveyed[7,8], but the prevalence of hyperlipidemia is known as around 10.8 % in the general adult population[9].

From the viewpoint of traditional Korean medicine, hyperlipidemia is regarded as the status of spleen-deficiency, phlegm-stagnation, accumulation and stasis of damp-heat, and Qi and blood stagnation[10,11]. Many patients with hyperlipidemia-associated symptoms prefer to visit Oriental doctors; however no systematic research for characterization of hyperlipidemia has been done in the Oriental medicine field.

This study was conducted to find a characterization of hyperlipidemia among 1,180 subjects who visited Daejon Oriental hospital for their medical examinations. This report should provide helpful information to manage patients with hyperlipidemia and to develop therapeutics using traditional Korean medicine.

Hyperlipidemia-related makers were analyzed using biochemical data from 1,180 subjects who took medical examination for the purpose of detecting cerebrovascular accident at Daejon Oriental Hospital over 5 years. These statistics have significance for having received objective analysis at the hospital. Also, this analysis can be regarded for promoting Korean medicine treatment of hyperlipidemia.

Method

1. Data collection and analysis

This study was conducted using data from subjects who received medical examinations for the purpose of stroke prevention in Daejeon Oriental hospital from July 2004 to June 2009. A total of 1,180 (496 male, 684 female) results were collected. The data for height, body weight, body mass index, blood pressure, total cholesterol, triglyceride, high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C), aspartate transaminase (AST), alanine transaminase (ALT), gamma-glutamic transp-eptidase (ɤ-GTP), blood urea nitrogen (BUN), creatine, and glucose level were analyzed.

2. Criteria for diagnosis of hyperlipidemia or body mass index

The diagnosis of hyperlipidemia was defined according to third report of the National Cholesterol Education Program (NCEP) expert panel on detection, evaluation, and treatment of high blood cholesterol in adults (adult treatment panel Ⅲ, ATP Ⅲ) in 2002[8,9]. Body mass index (BMI) was calculated by weight (kg) / [height (m)]^2 (Table 1).

3. Statistical analysis

Data were analyzed regarding to percent and frequency of hyperlipidemia and its differences of frequency in hyperlipidemia between male and female by χ^2 test. The statistical analysis used was SPSS for Windows 12.0 (SPSS inc., USA).

Results

1. Characteristics of the studied population

Among the total of 1,180 subjects, the ratio of male to female was 42 % to 58 %. The median age of subjects was 64 years old (from 25 to 87) and their median weight was 64 kg (from 38 to 123). The median BMI was 24.7 (from 14.9 to 45.7) (Table 2).

The means of cholesterol, triglyceride, HDL-cholesterol, and LDL-Cholesterol were 206.6, 156.4, 52.5, and 124.7 mg/dL, respectively. AST, ALT, ɤ-GTP, BUN, and creatine were within normal limits.

Table 1. ATP III Classification of Hyperlipidemia (mg/dL) and Body Mass Index

Total Cholesterol	Desirable (<200), Borderline high (200-239), High (≥240)
Triglyceride	Normal (<150), Borderline-high (150-199), High (200-499), Very high (≥500)
HDL-Cholesterol	Low (<40), Desirable (40-59), High (≥60)
LDL-Cholesterol	Optimal (<100), Near optimal/above optimal (100-129), Borderline high (130-159), High (160-189), Very high (≥190)
Body mass index	Under weight (<18.5), Normal weight (18.5-24.9), Overweight (25-29.9), Obese (30-39.9), Morbidly obese (≥40)

Table 2. Characteristics of the Studied Population

	Total	Male	Female
Number (%)	1180	496 (42 %)	684 (58 %)
Age (years)	64 (25-87)	63 (25-87)	64 (26-86)
Height (cm)	159 (138-185)	168 (150-185)	154 (138-172)
Weight (kg)	64 (38-123)	69 (39-101)	58 (38-123)
Body mass index	24.7 (14.9-45.7)	24.6 (14.9-34.1)	24.8 (16.7-45.7)
Total cholesterol (mg/dL)	206.6 ± 40.1	201.1 ± 39.0	210.6 ± 40.4
Triglycerides (mg/dL)	156.4 ± 94.5	169.5 ± 107.4	146.9 ± 82.7
HDL-cholesterol (mg/dL)	52.5 ± 13.9	50.0 ± 13.6	54.4 ± 13.8
LDL-cholesterol (mg/dL)	124.7 ± 30.8	121.0 ± 29.4	127.2 ± 31.6
AST	26.8 ± 15.2	28.2 ± 16.3	25.8 ± 14.3
ALT	26.6 ± 18.4	30.6 ± 18.6	23.8 ± 17.7
γ-GTP	31.5 ± 33.6	45.8 ± 45.4	22.3 ± 17.9
BUN	15.7 ± 4.6	16.2 ± 4.4	15.3 ± 4.7
Creatine	1.0 ± 0.6	1.1 ± 0.2	0.9 ± 0.8

Age, height, weight, and body mass index are expressed as median value (minimum - maximum) while others are expressed as mean value ± standard deviation.

All data had significant difference at $p < 0.05$ between males and females.

2. Analysis of hyperlipidemia–related fatty substances

19.7 % and 34.9 % of subjects had high and borderline high levels of serum total cholesterol, respectively (Fig. 1-A). About 40 % of subjects belonged to in hypertriglyceridemia including border-line high group (Fig. 1-B). For HDL-cholesterol, 24.0 % of subjects showed high levels whereas 17.2 % showed low levels of HDL-cholesterol (Fig. 1-C). For LDL-cholesterol, 26.2 %, 10.4 %, and 2.6 % of subjects showed borderline levels, high levels, and ultra high levels of LDL-cholesterol, respectively (Fig. 1-D).

3. Analysis of hyperlipidemia between males and females

The percentages of hyperlipidemia in males and females were compared (Fig. 2). Males showed higher percentages than females in hypertriglyceridemia
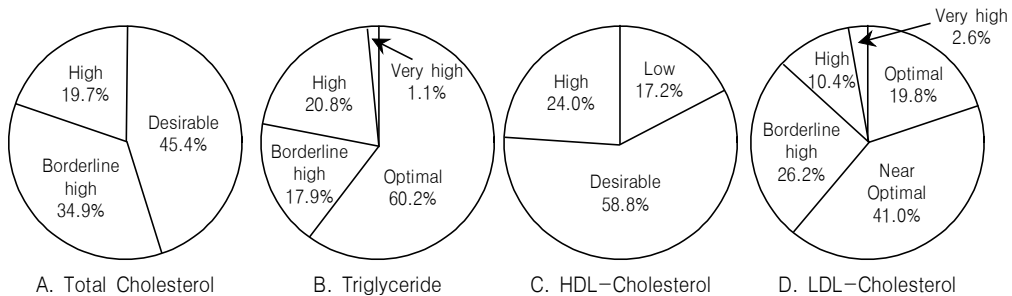

Fig. 1. Percentage of Hyperlipidemia regarding Cholesterol, Triglyceride, HDL–cholesterol, and LDL–Cholesterol
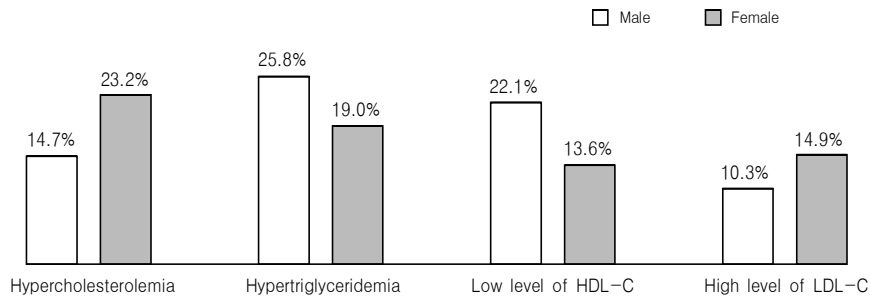
Fig. 2. Comparison of Percentage of Hyperlipidemia between Males and Females

(25.8 % vs. 19.0 %) and low levels of HDL-cholesterol (22.1 % vs. 13.6 %). In contrast, females showed higher percentages than males in hypercholesterolemia (14.7 % vs. 23.2 %) and high levels of LDL-cholesterol percentage (10.3 % vs. 14.9%). Except for the LDL-cholesterol (p = 0.156), these differences were statistically significant at p < 0.05 by χ^2 test.

Discussion

The changed lifestyle and progress of aging society have rapidly raised the prevalence of hyperlipidemia, hypertension, obesity, and diabetic mellitus, commonly called metabolic syndrome[12,13]. Among them, hyperlipidemia has been a medical issue as the top risk factor for cardiovascular diseases and stroke. The National Cholesterol Education Program of the US published a guide for lipid control in 2002[14].

According to this guideline, we hereby investigated the percentage of hyperlipidemia among 1,180 adults. In our study, the percentages of hypercholesterolemia and hypertriglyceridemia were 19.7 and 21.9 %, respectively. This result for hypercholesterolemia is much higher than the 10.8 % presented in data by the Ministry for Health, Welfare and Family Affairs in 2007[15]. This difference might result from the population gaps including age, sample character and regional restrictions. The median age in our study was 64 years old whereas above data was made with

a more general population over 30 years old. Also, this study was done for not the general population, but specific subjects who visited Daejon Oriental hospital for medical examination.

It is well known that the quantitative disorder as well as qualitative problems of blood lipids are equivalently important in hyperlipidemia-associated diseases[16,17]. Lack of physical activity and emotional and environmental stress induce an imbalance between HDL-cholesterol and LDL-cholesterol, which forms a basis of ischemic disorders in the heart, brain and elsewhere in the body[4,18]. In our data, the 19.2 % and 13 % of subjects showed abnormal levels of HDL-cholesterol and LDL-cholesterol. In summary, 35.5 % of patients had at least one non-normal range among the four blood lipids.

On the other hand, we found different patterns of lipids between males and females. The mean triglyceride level was higher in males, and hypertriglyceridemia was more prevalent in males, as expected. In contrast to triglycerides, mean cholesterol level and percentage of hypercholesterolemia were predominant in females. This result is dissimilar to two previous studies, which reported higher levels of both triglycerides and cholesterol in female[19,20]. Another group showed the same result as our data, and they implicated drinking habits for more prevalence of triglycerides in males[6]. Our study also found that males had more frequent abnormal ranges of HDL-cholesterol than

females, while females were against LDL-cholesterol. These gender-dependent different patterns of HDL/ LDL level is a new finding. Further studies will be required to verify whether this characterization is general or unique to only this population.

Epidemiology-based clinical study is critical for development of clinical therapy as well as drug development. Many patients with hyperlipidemia-associated disorders have chosen traditional Korean medicine. So far, most studies for those with hyperlipidemia have dealt with the western medicine field in Korea. Our study has critical limitations such as regional sample, comparatively aged subjects, not having detailed information for health-related behavior, and retrospective study design. Nevertheless, this analysis is a very important study as the first clinical investigation for the prevalence of hyperlipidemia and its characterization.

Taken together, we hope that this study will provide helpful information for patients with hyperlipidemia and to develop therapeutics using traditional Korean medicine.

Acknowledgement

References

1. Jain KS, Kathiravan MK, Somani RS, Shishoo CJ. The biology and chemistry of hyperlipidemia. Bioorg Med Chem. 2007; 15(14):4674-99.

2. Keenan JM. Treatment of patients with lipid disorders in the primary care setting: new treatment guidelines and their implications. South Med J. 2003; 96(3):266-75.

3. Havel RJ, Rappaport E. Management of primary hyperlipidemia. N Engl J Med. 1995; 332:14491-9.

4. Huang TL, Chen JF. Cholesterol and lipids in depression: stress, hypothalamo-pituitary-adrenocortical axis, and inflammation and immunity. Adv Clin Chem. 2005; 39:81-105.

5. Korea Health Industry Development Institute. Drug industry analysis statement in 2008.

6. Kim JK, Song JH, Cho HI, Kim SI. Survey Result on the Prevalence of Hyperlipidemia and Other Risk Factors of Coronary Artery Disease Among Korean Population. J Korean Clinical Pathology. 1991; 11(2):341-7.

7. Kim YH, Kim JK, Lee SW, Lim ST, Cha GW, Cho YJ, et al. The 10-years follow up study on serum total cholesterol levels in normal Korean adult male workers living in Pohang. J Korean Med. 2003; 65(6):675-81.

8. Choi MJ. Relations of Life Style, Nutrient Intake, and Blood Lipids in Middle-Aged Men with Borderline Hyperlipidemia. J Korean Community Nutrition. 2005; 10(3):281-9.

9. Korea National Statistical Office. Summary Report of the Cause of Death Statistics in 2008.

10. Shin WT, Heo JE, Kim TH, Hong SH, Kwon OS, Kim KT, et al. Clinical effect of Dodam-tang on hyperlipidemia patients. J. Orient. Int. Med. 2007; Fall:113-8.

11. Kim BC, Lee EJ, Park CS, Park CG. The experimental study on the effects of Dansamyeum on hyperlipidemia. J. Orient. Int. Med. 2000; 21:126-34.

12. Kwon HS, Park YM, Lee HJ, Lee JH, Choi YH, Ko SH, et al. The prevalence and clinical characteristics of the metabolic syndrome in middle-aged Korean adults. J Korean Med. 2005; 68(4):359-68.

13. Alberti KG, Zimmer PZ. Definition, diagnosis and classification of diabetes mellitus and its complications: part Ⅰ. Diagnosis and classification of diabetes mellitus, provisional report of a WHO

consultation. Diabetic Med. 1998; 15:539-53.

14. Expert Panel on Detection, Evaluation and Treatment of High Blood Cholesterol in Adults. Execute summary of the third report of the national cholesterol education program (NCEP) expert panel on detection, evaluation, and treatment of high blood cholesterol in adults (adult treatment panel Ⅲ). JAMA. 2001; 285: 2486-97.

15. Division of Disease Control Policy in Ministry for Health, Welfare and Family Affairs. Introduction of Major Chronic Disease Management Industry in 2009.

16. Chapman MJ. The potential role of HDL- and LDL-cholesterol modulation in atheromatous plaque development. Curr Med Res Opin. 2005; 21(Suppl 6):S17-22.

17. Taskinen MR. LDL-cholesterol, HDL-cholesterol or triglycerides - which is the culprit? Diabetes Res Clin Pract. 2003; 61(Suppl 1):S19-26.

18. Havel RJ, Rappaport E. Management of primary hyperlipidemia. N Engl J Med. 1995; 332:14491-9.

19. Choi KM, Cho YJ, Kim KO, Kim DR, Kim NH, Ahn JC, et al. Prevalence of Obesity and Correlation Between Obesity and Dyslipidemia in Elderly Population in South-West Seoul. J Korean Geriatr Soc. 2000; 4(3):119-28.

20. Shin YK, Bae SK, Chung WT, Lee MK, Lee DI, Moon CH. Lipid Distribution in Healthy Normal Korean Adults. J Korean Med. 1994; 47(5):587-602.