

Executive summary

In Korea, the prevalence of dyslipidemia in the age-standardized population over 30 years old is showing an increasing trend from 35.8% to 45.1% to 48.3%. As indicated in these figures, dyslipidemia is recognized as one of the major adult diseases in this country.

In the United States, dyslipidemia is defined as meeting one of the following criteria: total cholesterol (TC) \geq 240 mg/dl, low density lipoprotein (LDL) \geq 160 mg/dl, triglycerides (TG) \geq 200 mg/dl, or high density lipoprotein (HDL) $<$ 40mg/dl after eight-hour fasting. Dyslipidemia treatment with LDL as a primary target and TG as a secondary target is recommended in the United States. In Korea, on the other hand, the lipid profile is different such as lower HDL, TC, and LDL levels and higher TG level compared to western countries. As for characteristics by age group in Korea, TC, LDL, and TG increase to reach the peak in the age bracket of 40 to 49 years old or 50 to 59 years old, and then decrease in the later years of age, which indicates ethnic differences in the prevalence of this disease.

Due to these reasons, it is necessary to develop diagnostic criteria for dyslipidemia and a tool to calculate risks to cardiocerebrovascular diseases that better fit the situations in Korea. This study was aimed to investigate the relationship between the disease factors derived from dyslipidemic test values and health care utilizations claimed for the actual incidences of cardiocerebrovascular diseases by using the test results obtained from the Medical Examination Center Network under the umbrella of Korea Association of Health Promotion along with the insurance claim data obtained from the Health Insurance Review & Assessment Service. More specifically, these data were used to identify types of dyslipidemia with the biggest impact on the development of cardiocerebrovascular diseases in Korean adults and to explore a possibility of establishing diagnostic criteria by age for

dyslipidemia in association with development of cardiocerebrovascular diseases.

In the study results, the mean values of TC, HDL, LDL, TG, and non-HDL in the study subjects were 180.8, 51.5, 107.3, 111.8, and 129.3, respectively. Compared to the mean values of TC, HDL, LDL, and TG in Korean patients reported by the Korea Centers for Disease Control & Prevention in 2007 and National Health and Nutrition Examination Survey in 2007-2008, the subjects in this study seemed to have been comprised of lesser dyslipidemia compared to the overall population in Korea.

Among the total 42,275 subjects in this study, 638 subjects (1.5%) developed cardiocerebrovascular diseases. The incidence was slightly higher in men (1.6%) compared to women (1.2%). By age, the incidence of cardiocerebrovascular diseases among the men was 0.3% in subjects aged below 30, which then increased gradually with the increasing age, reaching the highest rate of 12.1% in the age group of 70 years old or above. For women, the incidence was lowest in below 30 of 0.1% then increased with age and highest in 70 or above of 10.1%.

In this study according to multivariable logistic regression models, for men, age, hypertension, TC, LDL, TG, and non-HDL were identified as risk factors of cardiocerebrovascular diseases. For women, age, hypertension, BMI and TG were identified as risk factors of cardiocerebrovascular diseases. The risk to develop cardiocerebrovascular diseases has increased in older ages. The study results also indicated that the out of normal range lab values were more associated with the development of cardiocerebrovascular diseases compared to the test values falling into the normal ranges.

In the final predictive model regarding the development of cardiocerebrovascular diseases, for men, age, hypertension, TG and non-HDL were included as variables with c-statistics of 0.783 and

concordant rate 73.5%. Similarly, for women, age, hypertension, and TG were included in the final model with c-statistics of 0.817 and concordant rate 77.1%.

Since the use of anti lipid drugs after lab test may influence the incidence of cardiocerebrovascular diseases, a subgroup analysis was added for the patients who never used a anti lipid drug after lab tests or whose drug compliance is under 0.5. In the subgroup analysis for men, age, hypertension, TC, LDL and non-HDL were identified as risk factors whereas age, hypertension, BMI and TG were identified as risk factors for women.

Limitations of this study are as follows: The comprehensive medical examination data, which served as basic data for this study, were provided by clinics and hospitals registered to the Korea Association of Health Promotion. This means that the study subjects were not randomly sampled, and this poses a question as to whether the cohort constructed in this study can represent the entire population in this country.

In this study, median follow-up time was 1.7 years for subjects who developed cardiocerebrovascular diseases and 3.7 years for subjects who did not. These periods are deemed rather short, and this can be another limitation for this study. Of particular note, since hyperlipidemia shows its impact after a long period of time, these periods are not exactly appropriate for the investigation of effects of hyperlipidemia on cardiocerebrovascular diseases. However, since the relevant law stipulates that the scope of data provided by the Health Insurance Review & Assessment Service should be limited to five-year information, this issue associated with source data is rather a legal problem.

Despite all these limitations, this study is still meaningful in that it has assessed the current status of cardiocerebrovascular diseases in

Korea, identified risk factors of these diseases, investigated types of dyslipidemia with the biggest impact on cardiocerebrovascular diseases in Korean patients, and suggested a predictive model of the development of cardiocerebrovascular diseases.