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The prevalence, awareness, treatment and control of dyslipidemia among adults in China

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ABSTRACT

Objectives: To analyze the prevalence, awareness, treatment, control and epidemiological characteristics of dyslipidemia in Chinese adults.
Methods: In this cross-sectional study, we adopted a multi-stage, stratified sampling method to obtain representative samples of the general population aged >18 years from different urban and rural regions in China. All subjects completed a lifestyle and medical history questionnaire and were examined for risk factors. Dyslipidemia was defined according to criteria of the 2007 Chinese Guidelines on Prevention and Treatment of Dyslipidemia in Adults. Continuous variables were compared using variance analysis. Multivariate logistic regression analysis was performed to explore the risk factors of dyslipidemia.
Results: The prevalence of dyslipidemia was 34.0% overall, and 35.1%, and 26.3% in urban and rural areas, respectively. The prevalence of dyslipidemia was significantly higher in men than women (41.9% vs 32.5%; $P < 0.001$). Rates of awareness, treatment, and control were 31.0%, 19.5%, and 8.9%, respectively. Increasing age (OR = 1.012; 95% CI:1.010, 1.014), male sex (OR = 1.411; 95% CI:1.318, 1.510), obesity (OR = 1.424; 95% CI:1.345, 1.507), cardiovascular disease (OR = 1.343; 95% CI:1.125, 1.603), diabetes (OR = 1.955; 95% CI:1.751, 2.182), hypertension (OR = 1.481; 95% CI:1.391, 1.577) and hyperuricemia (OR = 2.223; 95% CI:2.060, 2.399) were independent risk factors of dyslipidemia.
Conclusion: The prevalence of dyslipidemia among Chinese adults was high but awareness, treatment, and control of dyslipidemia were low. Urban high income earners and rural medium income earners show higher prevalence. Low income earners in urban and rural population have the worst awareness treatment, and control rate. There is an increased need for closely monitoring and controlling high risk factors in the populations including postmenopausal women, unhealthy lifestyle peoples and patients with chronic non-communicable diseases.

1. Background

Cardiovascular diseases (CVD) rank highest among the leading cause of death in developed countries [1] and most of developing countries as well as in China. A 2010 report on Great Britain suggested that 1.8 million people died of cardiovascular diseases, 800 000 of which was attributed to coronary heart disease and 490 000 to stroke [2]. According to data released by the National Center for Cardiovascular Disease in China in 2010, the number of deaths caused by cardiovascular disease in China has accounted for 40.4%, becoming the first cause of death [3].

CVD mortality rates are still rising in china [4]. Dyslipidemia is the leading cause of atherosclerosis, which is inextricably linked with the development of CVD [5]. It is also an independent risk

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factor for the development of coronary heart diseases [6] and cerebral ischemic stroke [7]. Although the prevalence of dyslipidemia and lipid level in Chinese adults is by far lower than that of many adults in western countries [8], but with changes that comes along with rapid socioeconomic growth, improved standard of living and change of lifestyle, the prevalence of dyslipidemia has been gradually increasing [6]. Dyslipidemia poses a serious threat to people's health in the general population. Tightly control of dyslipidemia promotes decrease in mortality and morbidity of CVD and therefore should be given attention. Epidemiology surveys of our country showed, successfully controlling lipid level can decrease the risks of ischemic CVD [6]. Early screening and preventive measures are equally significant in achieving these goals. Analysis of dyslipidemia in Chinese adults was made based on prevalence, awareness, treatment, control and epidemiological characteristics. Below is the current report of the results which provides direct guidelines to prevent and treat hyperlipidemia and cardiovascular diseases.

2. Methods

2.1. Research object

The China National Survey of Chronic Kidney Disease, conducted from January 2007, to October 2010, was a cross-sectional study designed to provide reliable data for the prevalence of chronic kidney disease and associated factors in adults in China. The details of the study population and methods have been published elsewhere [9]. This research adopts the multi-stage stratified sampling method to obtain representative samples of the general population over the age of 18. The study was approved by the Ethics Committee of Peking University First Hospital. A written informed consent was given by all participants before the collection of data and conduction of the research. 50 550 people were invited, and a total of 47 204 people agreed to participate in the research. The response rate was 93.0%. Finally, 43 368 cases with complete blood lipid data were included and analyzed.

2.2. Screening protocol and assessment criteria

All on-site screenings were conducted and completed from September 2009 to September 2010. Data were collected in examination centers at local health stations or community clinics in the participant's residential area. All participants completed a questionnaire including socio-demographic status (e.g., age, gender, income, level of education, etc.), past medical history (e.g., hypertension, diabetes mellitus, hepatitis, CVD, stroke, hyperlipidemia, chronic kidney disease, etc.), lifestyle (e.g., smoking, physical activity, and alcohol consumption) and family health history (hypertension, hyperlipidemia, diabetes mellitus, kidney diseases, etc.) under the supervision of doctors, medical students, trained general practitioners and nurses. Participants' blood and urine samples are taken. All blood and urine samples were analyzed at the central laboratory in each province. All the laboratories involved successfully completed a standardization and competency program. Fasting venous blood was drawn from subjects for the measurements of levels of total serum cholesterol (TC), triglyceride (TG), low density lipoprotein (LDL) and high density lipoprotein (HDL) by automatic biochemistry analyzer. TC and TG were estimated using enzymatic method with commercially available reagents while HDL and LDL using a timed-endpoint colorimetric method. Anthropometric measurements were obtained (e.g., blood pressure, weight, BMI, waist circumference and body height). The severity of hypertension was classified according to modified JNC-6 criteria. An average blood pressure was recorded for each participant after three conservative measurements with a minute interval between measurements using mercury sphygmomanometer. An average of two closely conservative blood pressure readings was recorded as the final blood pressure if the difference between measurements was greater than 10 mmHg. Glucose oxidase measurements were used to ascertain fasting blood glucose level.

2.3. Diagnostic criteria

Dyslipidemia is defined according to current lipids levels or use of anti-dyslipidemia medications in the past two weeks. The cut-off values for higher cholesterol, higher low density lipoprotein, lower high density lipoprotein and higher triglyceride were 6.22 mmol/L, 4.14 mmol/L, 1.04 mmol/L and 2.26 mmol/L, respectively [6].

Dyslipidemia awareness is the percentage of dyslipidemic people self-reported as diagnosed with dyslipidemia. Treatment ratio is defined as percentage of those who adopted interventions (drugs and lifestyle intervention). Control ratio refers to the proportion between dyslipidemic people with those treated and reached the lipid standard.

Lipid control standard is defined as cholesterol <6.22 mmol/L (240 mg/dL) and/or low density lipoprotein <4.14 mmol/L (160 mg/dL) and/or high density lipoprotein >1.04 mmol/L (40 mg/dL) and/or triglyceride < 2.26 mmol/L (200 mg/dl).

2.4. Statistical analyses

Statistical analyses were made based on different age, gender, geographical locality (urban or rural residency; North and South), and economic development as well as the influence of socioeconomic growth on Chinese adults with dyslipidemia. Continuous variables between groups were compared using variance analysis while categorical variables between groups were compared using Chi-square test. Relevant variables of descriptive statistics in accordance with the presence of stratified analysis was conducted for dyslipidemia. Prevalence rate was adjusted by age and gender using the Population of China in 2009 as a standard population. Multivariate logistic regression analysis was performed to explore associated risk factors of dyslipidemia. Covariates included in the multivariable logistic regression models were age (year), sex, smoking, drinking, obesity, CKD, hypertension, diabetes, hyperuricaemia, CVD, region (north vs south), family history of diabetes, family history of hypertension, family history of CVD and family history of CKD, etc. Epidata software (version 3.1) was used for data entry and management. All p values are bilateral, and a p value of less than 0.05 was considered significant. Analyses were done with SAS software, (version 9.1 SAS Institute Inc, Cary, NC, United States).

3. Results

43 368 subjects included 18 199 (41.96%) male and 25 169 (58.04%) female. The mean age was 50.24 ± 14.80 years (male mean age was 50.08 ± 15.40 years and female mean age was 50.36 ± 14.34 years). The number of cases represented by urban participants was 24 191 (55.78%) and that of rural participants was 19 177 (44.22%).

The characteristics of participants according to dyslipidemic and non-dyslipidemic status were shown in Table 1. Factors such as old age, male, urban participants, northern, higher income, high education, smoking, drinking, amount of physical activity, diabetes, hypertension, CKD, CVD, hyperglycemia, family history of high blood pressure, family history of CVD, family history of strokes, family history of diabetes, family history of CKD, long-term use antipyretic analgesics, central obesity, chronic kidney disease, high waist circumference, higher BMI, high uric acid, high blood pressure and low-eGFR had higher prevalence of dyslipidemia than normal population ($P < 0.05$, respectively), shown as Table 1.