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Risk Stratification of Atherosclerotic Cardiovascular Disease and Lipid Target Achievement Among Registered Hypertensive Patients in Yuetan Community, Beijing: A Post-Print Survey

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Abstract

Background Hypertension and dyslipidemia are major risk factors for cardiovascular and cerebrovascular diseases among Chinese residents. Understanding the atherosclerotic cardiovascular disease (ASCVD) risk stratification for hypertensive patients in the community and establishing individualized lipid intervention targets are crucial for optimizing primary care management of hypertensive patients and improving lipid target achievement rates. Objective To investigate the ASCVD risk stratification and lipid target achievement status among hypertensive patients in the Yuetan Community of Beijing, thereby providing data support for comprehensive management of hypertensive patients in community settings. Methods A total of 2,943 hypertensive patients registered at Yuetan Community Health Service Center and Qinan Community Health Service Station from January 1, 2019, to December 31, 2021, were enrolled. Baseline data were collected through review of health records and electronic medical records, and non-high-density lipoprotein cholesterol (non-HDL-C) and estimated glomerular filtration rate (eGFR) were calculated. Patients were stratified by ASCVD risk, and their lipid target achievement status was observed. Results Among the 2,943 hypertensive patients included, 1,201 were male and 1,742 were female, with a median age of 70 (63, 80) years. There were 2,165 high-risk ASCVD patients, 485 intermediate-risk ASCVD patients, and 293 low-risk ASCVD patients. The LDL-C target achievement rate was 10.5% (227/2,165) in high-risk ASCVD patients, 22.9% (111/485) in intermediate-risk ASCVD patients, and 98.0% (287/293) in low-risk ASCVD patients. The lipid target achievement rate was 14.1% (116/823) in patients with coronary heart disease, which was significantly higher than that in patients without coronary heart disease [9.1% (192/2,120)] (2=16.060, P<0.001). The lipid target achievement rate was 15.5%

(41/264) in patients with stroke, which was significantly higher than that in patients without stroke [10.0% (267/2,679)] (2=7.940, P=0.005). Conclusion The lipid target achievement rates are low in high-risk and intermediate-risk hypertensive patients. Lipid control is unsatisfactory in high-risk hypertensive patients with comorbid chronic kidney disease, diabetes, and various other risk factors. This issue warrants attention in the lipid management of hypertensive patients to improve lipid target achievement rates and reduce ASCVD risk.

Full Text

Risk Stratification of Atherosclerotic Cardiovascular Disease and Lipid Goal Attainment in Hypertensive Patients Registered in Beijing's Yuetan Community

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Abstract

Background: Hypertension and dyslipidemia are major risk factors for cardiovascular and cerebrovascular diseases among Chinese residents. Mastering the risk stratification of atherosclerotic cardiovascular disease (ASCVD) in community-dwelling hypertensive patients and formulating individualized lipid intervention targets play a vital role in optimizing the primary care management of hypertension and improving lipid goal attainment rates.

Objective: To investigate the ASCVD risk stratification and lipid goal attainment status among hypertensive patients in Beijing's Yuetan Community, providing data support for comprehensive hypertension management in community settings.

Methods: A total of 2,943 hypertensive patients registered at Yuetan Community Health Center and Qinan Community Health Station between January 1, 2019 and December 31, 2021 were enrolled. Baseline data were collected by reviewing health records and electronic medical records, and non-high-density lipoprotein cholesterol (non-HDL-C) and estimated glomerular filtration rate (eGFR) were calculated. Patients were stratified by ASCVD risk, and their lipid goal attainment was assessed.

Results: The cohort comprised 2,943 hypertensive patients, including 1,201 males and 1,742 females, with a median age of 70 (63, 80) years. ASCVD risk was high in 2,165 patients, moderate in 485 patients, and low in 293 patients. The LDL-C goal attainment rate was 10.5% (227/2,165) in high-risk patients,

22.9% (111/485) in moderate-risk patients, and 98.0% (287/293) in low-risk patients. Patients with concomitant coronary heart disease had a significantly higher lipid goal attainment rate than those without [14.1% (116/823) vs. 9.1% (192/2,120), $^2 = 16.060$, $P < 0.001$]. Similarly, patients with concomitant stroke had a higher attainment rate than those without [15.5% (41/264) vs. 10.0% (267/2,679), $^2 = 7.940$, $P = 0.005$].

Conclusion: Hypertensive patients classified as moderate- or high-risk for ASCVD exhibited low lipid goal attainment rates. Particularly concerning was the suboptimal lipid control among high-risk patients with hypertension who also had chronic kidney disease, diabetes, or multiple other risk factors. These findings underscore the need for greater emphasis on lipid management in hypertensive patients to improve control rates and reduce ASCVD risk.

Keywords: Hypertension; Atherosclerosis; Dyslipidemias; Community health services; Cross-sectional survey

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Introduction

The prevalence of hypertension among Chinese adults continues to rise [1]. The 2018 China Chronic Disease and Risk Factor Surveillance (CCDRFS) survey, which covered 298 counties/districts across 31 provinces, autonomous regions, and municipalities and included 179,873 residents aged $ $18 years, reported a hypertension prevalence of 27.5% [2]. Epidemiological data also reveal a substantial increase in the overall prevalence of dyslipidemia among Chinese adults aged $ $18 years, defined as the presence of any type of lipid abnormality [total cholesterol (TC) $\geq$ 6.22 mmol/L, low-density lipoprotein cholesterol (LDL-C) $\geq$ 4.14 mmol/L, high-density lipoprotein cholesterol (HDL-C) $<$ 1.04 mmol/L, or triglycerides (TG) $\geq$ 2.26 mmol/L], rising from 18.6% in 2002 to 40.4% in 2012 [3]. Hypertension and dyslipidemia represent important risk factors for atherosclerotic cardiovascular disease (ASCVD), and their coexistence markedly increases the risk of cardiovascular and cerebrovascular events [4]. A 2015 disease burden study identified hypertension and hypercholesterolemia as major risk factors for ischemic heart disease mortality in China [5]; however, fewer than 10% of patients at very high risk achieve the LDL-C target of <1.8 mmol/L [6], highlighting that blood pressure and lipid management remain critical public health challenges.

China's National Basic Public Health Service Standards clearly specify primary care management protocols and control targets for hypertension and diabetes [7], which are incorporated into performance evaluation indicators for community-based standardized chronic disease management. However, no similar primary care management standards exist for dyslipidemia, and lipid management is not currently included in performance assessments. Multiple domestic and international cardiovascular disease prevention guidelines recommend stratifying patients into low-, moderate-, high-, and very-high-risk categories based on in-

dividual ASCVD risk and setting corresponding LDL-C targets [8-11]. General practitioners should prioritize lipid stratification management in clinical practice and establish individualized lipid control goals to more effectively reduce patients' cardiovascular and cerebrovascular risk. This study investigates lipid stratification management among hypertensive patients in Beijing's Yuetan Community to identify gaps in comprehensive management and provide data to inform improvements in lipid management protocols at primary care institutions.

Methods

Study Population The study enrolled hypertensive patients registered at Yuetan Community Health Center and Qinan Community Health Station between January 1, 2019 and December 31, 2021. Inclusion criteria were: (1) diagnosis of hypertension at a hospital at or above the secondary level, or (2) current use of antihypertensive medication. Exclusion criteria were: long-term absence from medical care at Yuetan Community Health Center with unavailable medication or laboratory records in the system. A total of 2,943 patients were ultimately included. The study was approved by the Ethics Committee of Fuxing Hospital, Capital Medical University (2020FXHE-KY027).

Data Collection Baseline data were collected by reviewing health records and electronic medical records, including demographic information [age, sex, hypertension duration, body mass index (BMI), smoking status ($ $1 cigarette/day for $ $6 months continuously or cumulatively)], medical history (diabetes, coronary heart disease, stroke), and laboratory results [serum creatinine (Scr), total cholesterol (TC), LDL-C, HDL-C]. Laboratory data from within one year before the review date were used; if multiple results were available, the most recent was selected. Non-HDL-C was calculated as TC minus HDL-C. The estimated glomerular filtration rate (eGFR) was calculated using published formulas [12], as shown in Table 1.

Definitions and Criteria Chronic Kidney Disease (CKD) Staging: CKD was staged according to the *Guidelines for Early Screening, Diagnosis, Prevention, and Treatment of Chronic Kidney Disease (2022 Edition)* [13]: CKD Stage 1: eGFR $\geq$ 90 ml $\cdot$ min^{-1} $\cdot$ (1.73 m^2)$^{-1}$; Stage 2: eGFR 60–89 ml $\cdot$ min^{-1} $\cdot$ (1.73 m^2)$^{-1}$; Stage 3: eGFR 30–59 ml $\cdot$ min^{-1} $\cdot$ (1.73 m^2)$^{-1}$; Stage 4: eGFR 15–29 ml $\cdot$ min^{-1} $\cdot$ (1.73 m^2)$^{-1}$.

ASCVD Risk Stratification: Risk stratification followed the *Expert Consensus on Integrated Management of Blood Pressure and Lipids in Chinese Hypertensive Patients* [14]. High risk was defined as: (1) hypertension with any of the following: coronary heart disease; stroke; diabetes; CKD stages 3–4; LDL-C $\geq$ 4.9 mmol/L; or (2) hypertension with $ $3 other risk factors, including non-HDL-C $\geq$ 5.2 mmol/L, HDL-C $\leq$ 1.0 mmol/L, LDL-C $\geq$ 2.6 mmol/L, BMI $\geq$ 28.0 kg/m^2, smoking, age $ $45 years in men or $ $55 years in women.

Moderate risk was defined as hypertension with two other risk factors. Low risk was defined as hypertension with one or fewer other risk factors.

Lipid Goal Criteria: Based on the *Expert Consensus on Integrated Management of Blood Pressure and Lipids in Chinese Hypertensive Patients* [14], lipid goal attainment was defined as LDL-C <1.8 mmol/L for high-risk ASCVD patients, <2.6 mmol/L for moderate-risk patients, and <3.4 mmol/L for low-risk patients.

Statistical Analysis Normally distributed continuous variables were presented as mean ± standard deviation, while non-normally distributed variables were expressed as median (P_{25}, P_{75}). Categorical data were presented as frequencies and percentages, with between-group comparisons performed using the ^{2} test. Statistical significance was set at $P < 0.05$.

Results

Baseline Characteristics A total of 2,943 hypertensive patients were included, comprising 1,201 males and 1,742 females with a median age of 70 (63, 80) years. The median hypertension duration was 15 (10, 23) years, and the median BMI was 25.0 (23.0, 27.0) kg/m^2, with 19.5% (573/2,943) of patients having BMI ≥ 28.0 kg/m^2. Smoking was reported by 12.0% (352/2,943) of patients. Comorbidities were common: 42.5% (1,250/2,943) had diabetes, 28.0% (823/2,943) had coronary heart disease, 9.0% (264/2,943) had stroke, and 12.0% (354/2,943) had CKD stages 3–4. Laboratory values showed median TC of 5.0 (4.3, 5.8) mmol/L, median TG of 1.4 (1.1, 2.0) mmol/L, median HDL-C of 1.3 (1.2, 1.6) mmol/L, median LDL-C of 2.6 (2.2, 3.4) mmol/L, and median non-HDL-C of 3.6 (3.0, 4.4) mmol/L. Notably, 1.6% (78/2,943) had LDL-C ≥ 4.9 mmol/L, and 10.2% (301/2,943) had non-HDL-C ≥ 5.2 mmol/L.

ASCVD Risk Stratification and Lipid Goal Attainment Among the 2,943 hypertensive patients, 2,165 were classified as high-risk, 485 as moderate-risk, and 293 as low-risk for ASCVD. The LDL-C goal attainment rate was 10.5% (227/2,165) in high-risk patients, 22.9% (111/485) in moderate-risk patients, and 98.0% (287/293) in low-risk patients.

Analysis of Lipid Goal Attainment in High-Risk ASCVD Patients High-risk patients with coronary heart disease had a higher lipid goal attainment rate than those without [14.1% (116/823) vs. 9.1% (192/2,120), ^{2} = 16.060, $P < 0.001$]. Similarly, those with stroke had higher attainment rates than those without [15.5% (41/264) vs. 10.0% (267/2,679), ^{2} = 7.940, P = 0.005]. No statistically significant differences were observed between patients with and without diabetes [11.1% (139/1,250) vs. 10.0% (169/1,693), ^{2} = 0.990, P = 0.319], between those with and without CKD stages 3–4 [11.6% (41/354) vs. 10.3% (267/2,589), ^{2} = 0.535, P = 0.464], or between those with $ 3*versus* < 3*otherriskfactors*[10.9^{2}$ = 0.094, P = 0.759].

Discussion

Hypertension and hyperlipidemia are major public health concerns in China, characterized by large affected populations and high incidence rates. Inadequate management can lead to serious consequences and increase the burden of chronic disease prevention and control. The hypertensive patients managed in Yuetan Community were older (median age 70 years) and frequently had multiple co-existing conditions, including diabetes (42.5%), coronary heart disease (28.2%), and various other risk factors such as obesity and smoking. According to the *National Primary Care Diabetes Prevention and Management Manual (2019)* [12], the LDL-C target for high-risk ASCVD patients should be <1.8 mmol/L; however, this study found a mere 10.5% attainment rate among high-risk hypertensive patients, a finding that warrants urgent attention from primary care physicians.

Statins are widely used in lipid management, yet lipid goal attainment remains suboptimal in high-risk, very-high-risk, and ultra-high-risk ASCVD patients [5,16]. Potential reasons include: (1) limited awareness among both physicians and patients, with inadequate risk stratification in clinical practice leading to unclear lipid control targets; (2) poor patient adherence due to insufficient understanding of dyslipidemia risks; and (3) concerns about statin adverse effects leading to dose reduction or discontinuation. The low attainment rate of 10.5% in high-risk ASCVD patients—substantially lower than the 23.0% rate in moderate-risk patients—highlights the need for greater emphasis on lipid management in hypertension care. LDL-C has a dose-dependent log-linear relationship with ASCVD risk [17], and current guidelines prioritize LDL-C reduction as the primary therapeutic target for cardiovascular risk reduction [18]. General practitioners must enhance their understanding of ASCVD risk stratification to establish optimal lipid targets for hypertensive patients and achieve the greatest possible LDL-C reduction that patients can tolerate. Developing user-friendly risk assessment tools—such as evaluation forms or mini-programs—could facilitate patient assessment, while health education could improve self-management awareness and promote lifestyle modifications, enabling patients to understand their lipid levels and targets through collaborative physician-patient partnerships.

Notably, high-risk ASCVD patients with hypertension and coexisting coronary heart disease or stroke demonstrated significantly higher lipid goal attainment rates than those without these conditions, suggesting that general practitioners recognize these patients as high-risk and implement more aggressive lipid management. The *Expert Consensus on Integrated Management of Blood Pressure and Lipids in Chinese Hypertensive Patients* [14] identifies hypertension with diabetes, CKD stages 3–4, or baseline LDL-C $\geq$ 4.9 mmol/L as single high-risk factors requiring clinical attention. Hypertensive patients with diabetes constitute a large proportion of the cohort and often have additional risk factors such as advanced age, obesity, and smoking, necessitating strict lipid control. However, patients with multiple risk factors may be overlooked in clinical prac-

tice, potentially contributing to poor lipid control. Based on these findings, we propose the following recommendations: (1) Strengthen training for primary care physicians to improve ASCVD risk awareness, with mandatory risk stratification for newly diagnosed hypertensive patients to ensure comprehensive risk factor identification and individualized lipid targets, followed by annual reassessment; (2) Provide accessible and reliable assessment tools for clinical use; and (3) Incorporate population ASCVD risk management into performance evaluations rather than focusing solely on blood pressure and glucose control metrics. Lipid management in hypertensive patients should be proactive, aiming to prevent ASCVD events rather than intensifying treatment only after serious events occur.

This study has several limitations. The analysis relied on electronic health records and outpatient data from hypertensive patients without individualized ASCVD stratification. The absence of data on severe ASCVD events within the past 12 months precluded identification of an ultra-high-risk group, for whom guidelines recommend LDL-C <1.4 mmol/L and non-HDL-C <2.2 mmol/L. Additionally, the lack of family history of premature ischemic cardiovascular disease in the medical records meant this risk factor could not be included, potentially underestimating actual ASCVD risk. Clinical practice should involve individualized ASCVD risk stratification and personalized lipid management targets to improve patient awareness and achieve better lipid control, thereby reducing ASCVD risk.

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Author Contributions: BIAN Lili and LI Xiaoxiao designed the study, organized implementation, and performed data collation and statistical analysis. DU Xueping, DAI Qinfang, and WU Lin conducted feasibility analysis and revised the manuscript. SONG Beibei was responsible for data entry and statistical analysis. BIAN Lili provided quality control and final approval of the article.

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