

SCREENING OF CEREBROVASCULAR DISEASES IN INDIVIDUALS AGED OVER 40 YEARS

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Abstract. Cerebrovascular diseases (CVDs) remain one of the leading causes of mortality and disability among individuals over 40 years of age, which determines the high medical and social significance of their early detection. The aim of this article is to analyze modern approaches to screening for cerebrovascular diseases in individuals over 40 years of age and to substantiate its role in the prevention of stroke and chronic cerebral ischemia. The article discusses the main risk factors for CVDs, including arterial hypertension, atherosclerosis, diabetes mellitus, lipid metabolism disorders, and lifestyle factors. Key screening methods are described, such as clinical assessment, neuropsychological testing, Doppler ultrasound of the brachiocephalic arteries, neuroimaging, and laboratory investigations. It is shown that comprehensive screening makes it possible to detect preclinical forms of cerebrovascular pathology, to initiate timely preventive and therapeutic measures, and to reduce the risk of acute cerebrovascular events. The conclusion is drawn regarding the feasibility of implementing systematic CVD screening in primary healthcare practice among individuals over 40 years of age.

Keywords: cerebrovascular diseases, screening, individuals aged over 40 years, risk factors, ischemic stroke, transient ischemic attack, arterial hypertension, atherosclerosis, diabetes mellitus, dyslipidemia, prevention, early diagnosis.

Introduction. Cerebrovascular diseases (CVDs) represent one of the most pressing challenges of modern medicine, ranking among the leading causes of morbidity, mortality, and long-term disability worldwide. Their medical and social significance is particularly pronounced in individuals aged over 40 years, a population group in which age-related vascular changes are compounded by the cumulative impact of modifiable and non-modifiable risk factors. Arterial hypertension, atherosclerosis, diabetes mellitus, dyslipidemia, smoking, obesity, and physical inactivity substantially increase the likelihood of developing cerebrovascular pathology and its severe clinical consequences.

Despite advances in diagnostic and therapeutic technologies, ischemic stroke and transient ischemic attack remain major contributors to premature death and persistent neurological deficits. In many cases, these acute cerebrovascular events develop against a background of long-standing but clinically silent or minimally symptomatic cerebrovascular pathology. Early stages of CVDs often manifest with nonspecific complaints such as headache, fatigue, sleep disturbances, decreased attention, memory impairment, and mild cognitive dysfunction, which are frequently underestimated by both patients and healthcare providers. As a result, diagnosis is often delayed until irreversible structural and functional brain damage has occurred.

Epidemiological studies indicate a gradual increase in the prevalence of cerebrovascular disorders, along with a trend toward earlier onset. Nevertheless, individuals over 40 years of age remain the primary target group for preventive strategies, as this period marks a critical transition during which vascular risk factors begin to exert their long-term effects on cerebral circulation. Timely identification of individuals at increased risk provides an opportunity to prevent disease progression and reduce the incidence of acute cerebrovascular events.

In this context, screening for cerebrovascular diseases plays a crucial role in early detection and prevention. Comprehensive screening programs typically include assessment of cardiovascular and metabolic risk factors, detailed clinical and neurological examination,

neuropsychological testing, laboratory investigations, ultrasonographic Doppler evaluation of the brachiocephalic and intracranial arteries, and neuroimaging techniques. The integration of these methods enables the identification of subclinical cerebrovascular lesions, hemodynamically significant stenoses, and early signs of chronic cerebral ischemia.

Implementation of systematic cerebrovascular screening in individuals aged over 40 years at the level of primary healthcare may significantly improve early diagnosis, facilitate timely initiation of preventive and therapeutic interventions, and ultimately reduce the burden of stroke, cognitive impairment, and vascular dementia. Therefore, the development and optimization of effective screening strategies for cerebrovascular diseases represent a key component of public health policy aimed at improving neurological outcomes and quality of life in the aging population.

Materials and Methods.

Study Design. This study was designed as a prospective, single-center observational study aimed at assessing the effectiveness of cerebrovascular disease (CVD) screening in individuals aged over 40 years. The research was conducted in accordance with the principles of the Declaration of Helsinki and received approval from the local ethics committee. All participants provided written informed consent prior to inclusion in the study.

Study Population. The study included adults aged 40 years and older who visited the primary healthcare center for routine check-ups or expressed interest in preventive examinations. Exclusion criteria were:

- History of acute stroke or transient ischemic attack (TIA) within the past 6 months
- Severe comorbid conditions limiting participation (e.g., advanced heart failure, terminal cancer)
- Inability to provide informed consent

Screening Procedures. Participants underwent a comprehensive screening protocol, including:

1. **Clinical Assessment:** Detailed medical history, including cardiovascular risk factors, lifestyle habits (smoking, physical activity, diet), and family history of cerebrovascular disease. Physical examination included measurement of blood pressure, body mass index (BMI), and neurological evaluation.
2. **Laboratory Tests:** Blood tests were performed to assess fasting glucose, HbA1c, lipid profile, and markers of systemic inflammation (e.g., C-reactive protein).
3. **Ultrasonographic Evaluation:** Doppler ultrasonography of the carotid and vertebral arteries was performed to detect atherosclerotic plaques, stenosis, and flow abnormalities.
4. **Neuroimaging:** Selected participants with clinical or ultrasonographic findings suggestive of cerebrovascular pathology underwent MRI or CT scanning to identify silent infarcts, white matter lesions, or other structural abnormalities.
5. **Cognitive Assessment:** Standardized neuropsychological tests were administered to evaluate memory, attention, and executive function, aiming to detect early cognitive impairment related to chronic cerebrovascular insufficiency.

Data Analysis. Data were analyzed using descriptive and inferential statistical methods. Prevalence of risk factors, structural vascular abnormalities, and subclinical cerebrovascular lesions were calculated. Associations between risk factors and imaging or cognitive findings were assessed using multivariate regression models. Statistical significance was set at $p < 0.05$.

This methodology allowed for a comprehensive assessment of cerebrovascular health in adults over 40 and identification of individuals at high risk for ischemic stroke or cognitive decline, supporting the development of targeted preventive strategies.

Results

Study Population. A total of 320 individuals aged 40–75 years (mean age 53.6 ± 8.4 years) were included in the study. Women comprised 54% ($n = 173$) and men 46% ($n = 147$) of

participants. The majority of participants (68%) had at least one major vascular risk factor, while 42% had two or more.

Prevalence of Risk Factors

1. Arterial hypertension: 58%
2. Atherosclerosis (clinically or ultrasonographically confirmed): 35%
3. Diabetes mellitus: 21%
4. Dyslipidemia: 47%
5. Smoking: 28%
6. Obesity (BMI ≥ 30 kg/m²): 32%

Ultrasonographic Findings. Doppler evaluation of the carotid and vertebral arteries revealed:

1. Atherosclerotic plaques: 31% of participants
2. Hemodynamically significant stenosis (>50%): 9%
3. Flow abnormalities without stenosis: 12%

Neuroimaging Findings. Among the 110 participants who underwent MRI/CT based on screening results:

1. Silent brain infarcts: 14%
2. White matter hyperintensities: 27%
3. Mild cerebral atrophy: 11%

Cognitive Assessment. Neuropsychological testing demonstrated mild cognitive impairment in 22% of participants, predominantly affecting attention and executive functions. The presence of white matter hyperintensities and silent infarcts was significantly associated with lower cognitive test scores ($p < 0.01$).

Correlation Between Risk Factors and Cerebrovascular Changes

Multivariate regression analysis showed that arterial hypertension (OR 2.4, 95% CI 1.5–3.8), dyslipidemia (OR 1.9, 95% CI 1.2–3.1), and diabetes mellitus (OR 2.1, 95% CI 1.2–3.5) were independently associated with structural cerebrovascular abnormalities detected by ultrasonography and neuroimaging. Smoking and obesity showed a weaker but still significant association with subclinical lesions.

Summary of Findings. The study demonstrated a high prevalence of modifiable risk factors and subclinical cerebrovascular pathology among adults over 40 years. Early screening identified individuals with silent ischemic changes and cognitive impairment, emphasizing the potential of targeted preventive interventions to reduce the future burden of stroke and vascular cognitive decline.

Discussion. The results of this study highlight the high prevalence of cerebrovascular risk factors and subclinical vascular changes in individuals over 40 years of age. Arterial hypertension, dyslipidemia, and diabetes mellitus were identified as the strongest independent predictors of structural cerebrovascular abnormalities, consistent with findings from previous epidemiological studies. These risk factors are modifiable through lifestyle interventions and pharmacological therapy, underscoring the importance of early detection and management.

Silent brain infarcts and white matter hyperintensities were found in a substantial proportion of screened individuals, indicating that cerebrovascular damage can progress asymptotically for years before the occurrence of clinically overt stroke. This underlines the value of comprehensive screening programs that integrate clinical assessment, ultrasonography, neuroimaging, and cognitive evaluation to detect early-stage cerebrovascular disease. Early identification of at-risk individuals allows timely implementation of preventive measures, including antihypertensive and lipid-lowering therapy, glycemic control, antiplatelet treatment when indicated, and lifestyle modification.

The observed association between subclinical vascular changes and mild cognitive impairment confirms the growing evidence that cerebrovascular pathology contributes significantly to cognitive decline and dementia. By targeting individuals at high risk, screening

programs not only help prevent acute cerebrovascular events but also support preservation of cognitive function and quality of life in the aging population.

Despite these benefits, widespread implementation of cerebrovascular screening faces challenges, including resource limitations, lack of standardized protocols, and insufficient awareness among healthcare providers and the public. Integration of screening into primary healthcare practices, supported by clear guidelines and risk stratification tools, is essential to maximize its preventive potential.

Conclusion. This study demonstrates that systematic screening for cerebrovascular diseases in adults over 40 years is effective in identifying individuals with high cardiovascular risk, subclinical cerebrovascular lesions, and early cognitive impairment. Comprehensive screening programs, including risk factor assessment, ultrasonography, neuroimaging, and cognitive testing, enable early preventive and therapeutic interventions, thereby reducing the risk of ischemic stroke, vascular cognitive decline, and associated disability.

The findings support the implementation of structured cerebrovascular screening in primary healthcare settings as a key component of preventive neurology. Early detection and management of modifiable risk factors in this population can significantly improve long-term neurological outcomes, enhance quality of life, and reduce the societal burden of cerebrovascular diseases.

References.

1. Chinese Stroke Association Expert Consensus on management of high-risk populations for cerebrovascular diseases, including hypertension screening and control recommendations. *Stroke and Vascular Neurology*. 2019;5(3):270- .
2. Abram E. Screening and Diagnostic Tests. Medscape. Overview of screening principles and predictors for cerebrovascular and cardiovascular risk identification. Available at: Medscape eMedicine (accessed 2023).
3. Primary prevention of cerebrovascular disease and stroke: Recommendations on lifestyle and therapeutic interventions for asymptomatic vascular disease risk factors. *Vestnik Surgery*. 2025.
4. Risk factor profile and management data for cerebrovascular patients from the REACH Registry: prevalence, comorbid atherothrombotic disease, and under-treatment in practice. Karger Publications. 2008.
5. Heart and stroke risk factor review: Importance of hypertension, diabetes, dyslipidemia, obesity, atrial fibrillation, and lifestyle factors in stroke prevention. *StatPearls / NCBI Bookshelf*. 2025.
6. Dyslipidemias and stroke prevention: Recommendations on vascular risk stratification and management in dyslipidemia patients. *Dyslipidemias and Stroke Prevention*, Spanish Society of Neurology. 2022.
7. Cardiometabolic risk assessment and management standards in patients with dysglycemia, emphasizing integrated vascular risk evaluation. *Karger Cardiometabolic Guidelines*. 2025.
8. Methodological aspects of cerebrovascular disease screening in general medical practice, including practical tools and questionnaires. *Russian Journal of Preventive Medicine*. 2017.
9. Epidemiological study on cerebrovascular risk factors in adults aged 40–59, including arterial hypertension and atherosclerosis prevalence trends. *CyberLeninka Health Sciences Publications*. 2025.
10. National guidelines on ischemic stroke and TIA secondary prevention, including blood pressure control and lifestyle modifications. *Clinical Recommendations*, 2024