Postprint: Analysis of Prevalence and Influencing Factors of Motoric Cognitive Risk Syndrome in Community-Dwelling Older Adults

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Abstract

Objective: To investigate the prevalence of motoric cognitive risk syndrome (MCR) among community-dwelling older adults and analyze its influencing factors.

Methods: Using convenience sampling, 1054 older adults from a community in Beijing were surveyed from January 2019 to January 2022. After applying inclusion and exclusion criteria, 459 older adults were selected as study participants. Based on assessment criteria for subjective cognitive decline and gait speed decline, participants were divided into MCR and non-MCR groups. A self-designed questionnaire was used to collect demographic data, physiological factors, psychological factors, lifestyle, nutritional status, disease history, and medication history. The Barthel Index was used to assess activities of daily living, the Lawton IADL Scale was used to assess instrumental activities of daily living, the Geriatric Depression Scale-15 (GDS-15) was used to assess depressive status, the Generalized Anxiety Disorder-7 (GAD-7) was used to assess anxiety status, and the Mini Nutritional Assessment-Short Form (MNA-SF) was used to assess nutritional status. Univariate analysis and multivariate binary Logistic regression analysis were employed to explore influencing factors of MCR occurrence.

Results: Among 459 community-dwelling older adults, 125 (27.2%) had MCR and 334 (72.8%) were non-MCR. Binary Logistic regression analysis revealed that age, activities of daily living, instrumental activities of daily living, high physical activity, hypertension, stroke/TIA, and anxiety status were influencing factors for MCR occurrence in community-dwelling older adults ($P<0.05$).

Conclusion: The prevalence of MCR among community-dwelling older adults is relatively high. Community healthcare professionals should screen for MCR and

analyze influencing factors, assist in controlling chronic diseases and establishing healthy lifestyles, thereby improving cognitive status in these patients.

Full Text

Analysis of the Current Status and Influencing Factors of Motoric Cognitive Risk Syndrome in Community-Dwelling Elderly

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Abstract

Objective: To investigate the prevalence of Motoric Cognitive Risk Syndrome (MCR) among community-dwelling elderly and analyze its influencing factors.
Methods: Using convenience sampling, 1,054 elderly individuals from a Beijing community were surveyed between January 2019 and January 2022. After applying inclusion and exclusion criteria, 459 elderly participants were selected. Based on evaluation criteria for subjective cognitive decline and gait speed reduction, participants were divided into MCR and non-MCR groups. A self-designed questionnaire was used to collect demographic data, physiological factors, psychological factors, lifestyle, nutritional status, and disease/medication history. The Barthel Index was used to assess activities of daily living (ADL), the Lawton IADL Scale for instrumental activities of daily living, the Geriatric Depression Scale-15 (GDS-15) for depressive symptoms, the Generalized Anxiety Disorder-7 (GAD-7) for anxiety symptoms, and the Mini Nutritional Assessment Short Form (MNA-SF) for nutritional status. Univariate analysis and multivariate binary logistic regression were performed to explore factors associated with MCR.
Results: Among 459 community elderly, 125 cases (27.2%) had MCR and 334 cases (72.8%) were non-MCR. Binary logistic regression showed that age, ADL, instrumental ADL, high physical activity, hypertension, stroke/TIA, and anxiety were significant influencing factors ($P < 0.05$).
Conclusion: The prevalence of MCR is high among community elderly. Community healthcare providers should screen for MCR and analyze influencing factors to assist in chronic disease management and establishment of healthy lifestyles, thereby improving cognitive outcomes.

Keywords: elderly; Motoric Cognitive Risk Syndrome

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Introduction

With accelerating population aging, dementia has become one of the most serious threats to quality of life in older adults. Currently, there are no specific medications or special treatment protocols, making early diagnosis and prevention particularly crucial [1-3]. Recent research has demonstrated that both subjective cognitive decline and gait abnormalities serve as important screening and intervention windows in the pre-dementia stage [4-6]. Motoric Cognitive Risk Syndrome (MCR) refers to the simultaneous presence of subjective cognitive decline and slow gait in older adults without mobility impairment or dementia. This high-risk clinical syndrome increases the risk of adverse events including falls [7], hospitalization [8], disability [9], and mortality [10], and can effectively predict dementia onset in older adults [11]. Early screening for MCR in elderly populations and identifying risk factors are essential for controlling dementia and related adverse health events [12].

Currently, research on MCR in China is still in its infancy, with few large-scale epidemiological studies and a complete absence of intervention studies. Therefore, this study screened community elderly for MCR and comprehensively analyzed influencing factors from perspectives including demographic characteristics, physiology, psychology, lifestyle, nutrition, disease history, and medication history. The aim was to identify risk factors for MCR in this population and provide evidence for effective early intervention strategies.

1. Subjects and Methods

1.1 Study Subjects This cross-sectional study utilized data from a long-term cohort study of community elderly. Between January 2019 and January 2022, 1,042 elderly individuals from a Beijing community were surveyed. After applying inclusion and exclusion criteria, 459 eligible elderly participants were ultimately included.

Inclusion criteria: (1) Age $ $60 years, able to communicate normally with investigators, and voluntarily agreed to participate after being informed of the study purpose; (2) Subjective cognitive decline assessment: screened using the memory question from the GDS-15 [13] (“Do you feel your memory is worse than most people?”) with an affirmative answer, combined with cognitive evaluation using the Chinese version of the Montreal Cognitive Assessment-Basic (MoCA-B) with cut-off scores of 25 for ages 60-79, 24 for ages 80-89, and 23 for ages $ $90—scores above these cut-offs were considered indicative of subjective cognitive decline [14]; (3) Gait speed assessment: evaluated using the 6-meter walk test performed twice, with the faster time recorded—gait speed $ $0.8 m/s

was considered reduced [15]. Participants with both subjective cognitive decline and slow gait were assigned to the MCR group, while others constituted the non-MCR group.

Exclusion criteria: (1) MoCA scores suggestive of AD or mild cognitive impairment; (2) Loss of self-care ability requiring long-term nursing care; (3) History of hip fracture or hip prosthesis replacement; (4) Acute or chronic neurodegenerative diseases causing cognitive impairment, such as acute cerebrovascular events, epilepsy, Parkinson' s disease, or frontotemporal dementia; (5) History of severe anxiety, depression, or other psychiatric disorders with severe symptoms; (6) Severe hearing or vision impairment, or severe aphasia. This study obtained informed consent from all participants and was approved by the PLA General Hospital Research Ethics Committee (Approval No.: S2018-102-02), and registered with the Chinese Clinical Trial Registry (Registration No.: ChiCTR1900022576).

1.2 Research Tools A self-designed questionnaire was used, including: (1) **Demographics:** age, gender, education level, marital status; (2) **Physiological factors:** BMI, vision/hearing impairment, ADL assessed using the Barthel Index (10 items: bowel/bladder control, grooming, toileting, feeding, bathing, dressing, bed-chair transfer, ambulation, stair climbing; total score 0-100, higher scores indicate better independence; Cronbach' s $\alpha = 0.946$), and instrumental ADL using the Lawton IADL Scale (8 items: telephone use, shopping, food preparation, housekeeping, laundry, transportation, medication management, finances; total score 0-8, higher scores indicate greater independence) [17]; (3) **Psychological factors:** Depression assessed with GDS-15 (15 yes/no items, score 0-15, $ $5 indicating depressive symptoms) [18]; Anxiety assessed with GAD-7 (7 items, $ $5 indicating anxiety symptoms) [19]; (4) **Lifestyle:** Alcohol consumption (none in past 6 months vs. $ $1 time/month), smoking (smoking for >6 months and smoked in past 30 days), exercise type, weekly exercise duration (low physical activity: <120 min/week for women, <150 min/week for men) [20]; (5) **Nutrition:** MNA-SF (6 items, total score 14, higher scores indicate better nutrition) [21]; (6) **Disease history:** Total chronic disease count and specific conditions (hypertension, coronary heart disease, chronic heart failure, arrhythmia, hyperlipidemia, stroke, multiple lacunar infarcts/TIA, chronic lung disease, digestive diseases, type 2 diabetes, peripheral arterial disease, chronic kidney disease, connective tissue disease/rheumatism, cancer, knee osteoarthritis, fracture history in past 2 years, eye disease, oral disease); (7) **Medication history:** Current medications, with polypharmacy defined as $ $5 concurrent medications [22].

1.2.2 Quality Control Quality control measures included: (1) Explaining study purpose, methods, and significance before investigation to ensure informed consent; (2) Training and assessing investigators to ensure mastery of scale content and administration methods; (3) Double-checking questionnaires and data entry to ensure accuracy.

1.2.3 Statistical Methods SPSS 26.0 was used for data analysis. Normally distributed continuous data were expressed as mean ± standard deviation ($\bar{x} \pm s$), and categorical data as frequencies and percentages (%). Participants were divided into MCR and non-MCR groups. Continuous variables were compared using t-tests, and categorical variables using ^{2} tests. Binary logistic regression was used to analyze factors associated with MCR. $P < 0.05$ was considered statistically significant.

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2. Results

2.1 Basic Characteristics The study included 459 elderly participants aged 61-99 years (mean 82.25 ± 7.60). MoCA total scores ranged 23-30 (mean 26.24 ± 1.87). There were 254 males (55.3%) and 205 females (44.7%). Education levels: junior high or below (61 cases, 13.3%), high school/technical secondary (112 cases, 24.4%), junior college (110 cases, 24.0%), and university or above (176 cases, 38.8%). Marital status: with spouse (339 cases, 73.9%), without spouse (120 cases, 26.1%).

2.2 MCR Prevalence in Community Elderly Among 459 elderly, 125 cases (27.2%) had MCR, with mean MoCA score 25.79 ± 2.01 and mean gait speed 0.62 ± 0.14 m/s. The 334 non-MCR cases had mean MoCA score 26.40 ± 1.79 and mean gait speed 1.09 ± 0.19 m/s.

2.3 Univariate Analysis of MCR Influencing Factors Univariate analysis identified significant differences in age, ADL (Barthel Index), instrumental ADL (Lawton-IADL), weekly exercise duration, anxiety, nutrition, hypertension, heart failure, arrhythmia, stroke/TIA, multiple lacunar infarcts, diabetes, peripheral vascular disease, osteoarthritis, fracture history, eye disease, oral disease, and polypharmacy ($P < 0.05$). See Table 1 .

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3. Discussion

3.1 High Prevalence of MCR in Community Elderly As a novel pre-dementia syndrome for effective prediction, MCR research in China remains exploratory. Due to varying evaluation criteria and tools, reported MCR prevalence differs across studies. Our study found a 27.2% MCR prevalence, higher than previous Chinese studies reporting 9.6%-12.7% [23-24]. This may be because our screening used MoCA in addition to subjective cognitive complaints, excluding suspected mild cognitive impairment cases, making inclusion criteria stricter, and because our sample was older. This suggests community healthcare providers should strengthen awareness campaigns about dementia prevention, actively screen for MCR, and develop targeted interventions.

3.2 Analysis of MCR Influencing Factors in Community Elderly Demographics: Age was a risk factor for MCR, consistent with most previous studies [25-26]. Aging may cause changes in neuronal connections, hippocampal atrophy, cerebrovascular sclerosis, and cerebral hypoperfusion leading to cognitive decline [27]. Gait and cognition share common domains, with different quantitative gait parameters reflecting connections to distinct cognitive domains. Patients with gait, balance, or motor dysfunction have higher risks of falls and progression to AD [28]. Therefore, older individuals warrant greater attention, with early cognitive and gait training to improve function.

Self-care ability: Both ADL (Barthel Index) and instrumental ADL (Lawton-IADL) were associated with MCR. Previous studies show ADL, particularly instrumental ADL, are protective factors against subjective cognitive decline [29]. A 10-year cohort study of 1,467 German older adults found ADL positively correlated with cognitive function, with IADL decline increasing dementia risk sixfold [30]. Gait speed is highly correlated with balance and motor function; reduced gait speed decreases physical activity and functional capacity, affecting independent living [31]. This suggests healthcare providers and caregivers should monitor daily performance and encourage continued engagement in manageable activities to slow MCR progression.

Physical activity: Previous research shows sedentary behavior and lack of exercise are MCR risk factors [32]. Semba et al. found MCR positively correlated with low physical activity and obesity [33], while healthy controls exercised more frequently than MCR groups [34]. Physical activity may protect against MCR by reducing cardiovascular risk factors like hypertension and insulin resistance, and through anti-inflammatory and immune-enhancing effects [35-36]. Encouraging increased physical activity and muscle strengthening may improve cognitive function in MCR patients.

Disease history: Chronic diseases significantly impact elderly health, with disease count, severity, type, and frequency all influencing MCR development [37]. Our study found hypertension and stroke/TIA were associated with MCR. Chronic hypertension causes atherosclerosis and vascular intimal changes, reducing cerebral blood supply and affecting periventricular white matter perfusion, which is crucial for executive function and gait-cognitive control [38]. Cerebrovascular disease significantly impacts cognition. A French gait study systematic review found adults with stroke history had double the MCR risk [39]. Wang et al. [40] found MCR associated with frontal lacunar infarcts in Indian older adults. Therefore, encouraging hypertension and stroke control can delay MCR onset.

Psychological factors: Anxiety was associated with MCR, consistent with previous research. A 17-year follow-up study found anxiety symptoms were risk factors for cognitive impairment and dementia [41]. The Canadian Longitudinal Study on Aging showed depression, anxiety, and related medications were closely associated with MCR [42]. Increasing anxiety severity causes fatigue, pain, and autonomic dysfunction, reducing physical function and gait speed, leading to

MCR. Early anxiety identification and maintaining positive psychological states can improve cognitive function.

In summary, MCR prevalence is high among community elderly, influenced by age, ADL, physical activity, disease history, and psychological factors. Community healthcare providers should screen for MCR, focusing on older adults with decreased ADL, low physical activity, hypertension, stroke, and anxiety. Assisting with chronic disease management and healthy lifestyle promotion can delay dementia progression. This study has limitations: the cross-sectional design cannot establish temporal relationships between exposures and MCR outcomes. Future research will expand sample sizes and conduct longitudinal follow-up for more robust findings.

Conflict of Interest: All authors declare no conflicts of interest.

Author Contributions: Yang Cunmei: conceptualization, design, data collection, data processing, interpretation, statistical analysis, writing, revision; Shu Gangming: conceptualization, design; Hu Yixin: coordination, analytical guidance; Li Jiadai: data collection; Ma Hongying, Zhang Tianyi: revision; Wu Bing, Yan Jin, Mao Xin: data compilation; Li Tianzhi: coordination.

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Note: Figure translations are in progress. See original paper for figures.