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Incidence of Motoric Cognitive Risk Syndrome and Associated Factors in Older Adults in Türkiye

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Background: Motoric cognitive risk syndrome (MCRS) is characterized by slow gait and subjective cognitive decline. It is a predementia syndrome associated with an increased risk of dementia and mortality.

Aims: To investigate the incidence of MCRS and its associated factors in older adults in Türkiye.

Study Design: A retrospective study.

Methods: This study enrolled community-dwelling older adults admitted to the geriatric outpatient clinic. Participants were assessed for MCRS according to previously described criteria. Logistic regression analysis was conducted to evaluate the association among MCRS and demographic features, clinical status, and geriatric syndromes.

Results: Of the 1,352 older adults examined, 577 met the inclusion criteria, and the mean age was 75.2 years. The overall incidence of MCRS was 7.8%. The MCRS group was predominantly older, female, and unmarried, with polypharmacy and higher Deyo-Charlson comorbidity index and Yesavage geriatric depression scale scores than the non-MCRS group. In the multivariate model, significant associations were found between MCRS and age and polypharmacy [odds ratios (OR), 2.22; 95% confidence interval (CI), 1.04-4.71, $p = 0.039$; OR, 2.02; 95% CI, 1.02-3.99, $p = 0.043$, respectively].

Conclusion: The overall incidence of MCRS was found in 7.8% of older adults. Advanced age and polypharmacy are risk factors associated with MCRS.

INTRODUCTION

The negative effects of aging on cognitive function range from subjective cognitive decline to dementia.[1,2] Subjective cognitive decline is defined as memory complaints but with intact objective cognitive test results and functional status.[2] Individuals with subjective cognitive decline are at higher risk of dementia development.[3] Cognitive decline at an advanced age is also associated with slower gait speed, which accelerates the decline in the performance of various activities of daily living, resulting in adverse outcomes such as disability, falls, need for institutional care, and mortality.[4-7]

Motoric cognitive risk syndrome (MCRS) is a potentially disabling predementia syndrome, which is characterized by subjective cognitive decline and slow gait.[8] Although the incidence of MCRS varies between 2.4% and 33.3% in different countries, the combined incidence was reported to be 9%.[9] Older women and individuals with lower educational levels, depression, or cardiovascular risk factors are at greater risk for MCRS.[9] However, risk factors of MCRS may be different between races because of differences in health-related behaviors and lifestyles; therefore, these should be identified in different countries, and appropriate preventive strategies should be developed. However, in this vulnerable population, evidence is limited in the prevention and treatment of modifiable risk factors for dementia.[10]

Considering the rapid increase in the rate of cognitive impairment in older populations in Türkiye, accurate screening and detection of early dementia stages, which significantly reduces healthy life expectancy, is important.[11,12] However, to date, no studies have reported MCRS and its associated risk factors in Türkiye. Therefore, this study aimed to evaluate the incidence and MCRS-related factors in older adults in.

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MATERIALS AND METHODS

Study design and participants

This retrospective study enrolled community-dwelling older adults who visited the geriatric outpatient clinic for routine examinations between November 2016 and February 2023 and underwent a comprehensive geriatric evaluation. The study was approved by the local ethics board in accordance with the Declaration of Helsinki.

The inclusion criteria were as follows: (a) age ≥ 65 years, (b) independent in performing activities of daily living (Barthel activities of daily living index score ≥ 95 points), (c) mini-mental state examination (MMSE) score ≥ 24 points, and (d) ability to walk with or without an assistive device.

The study exclusion criteria were as follows: diagnosis of major depression [confirmed diagnosis or a score of > 10 on the 15-item Yesevage geriatric depression scale (YGDS)], generalized anxiety disorder, delirium, Parkinson's disease, anemia (hemoglobin < 13 g/dl for men and < 12 g/dl for women, thyroid disease [TSH] ≥ 10 mIU/l or TSH ≤ 0.05 mIU/l), vitamin B12 deficiency, malnutrition (mini nutritional assessment short form score ≤ 7), terminal illness, auditory or visual disability, or incomplete records (Figure 1).

MCRS diagnosis

The criteria suggested by Verghese et al.[8] were used to diagnose MCRS. Accordingly, the participants were required to meet the following criteria:

I. Subjective cognitive complaints: Individuals experiencing a decline in cognitive status unrelated to an acute event for a long time and having daily concerns or answering "yes" to the YGDS item, "do you feel you have more problems with memory than most?" and normal performance on MMSE (≥ 24 points) were considered to have probable subjective cognitive complaints.[13] An experienced geriatrician made the final clinical diagnosis after ruling out reversible causes of cognitive dysfunction, MCI, and dementia.

II. Slow gait speed: Gait speed was assessed on a flat surface over a distance of 4.57 m. At the beginning of the test, participants were placed in a standing position. The test area consisted of a 5-step acceleration zone, a 15-step (4.57 m) central test zone, and a 5-step zone for deceleration. The time required to complete the central test zone was measured with a stopwatch. The test was applied twice, with a 1-min rest given between each application, and the average time of the two tests was recorded. The walking speed was obtained by dividing the distance covered (4.57 m) by the travel

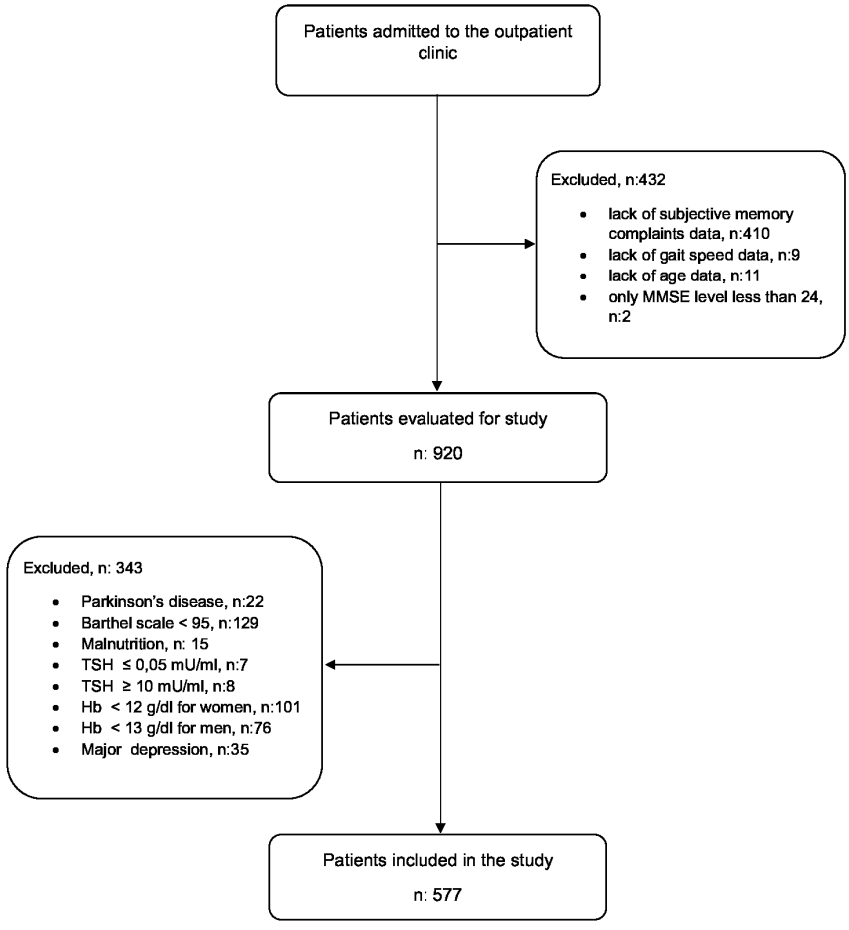

FIG. 1. Flow chart of the patient selection process.

time (m/s). Participants were classified as having slow or normal walking speed according to the Fried criteria, which required classification by sex and height.[14]

III. Absence of dementia: Not meeting the Diagnostic and Statistical Manual of Mental Disorders Fifth Edition (DSM-5) criteria for the diagnosis of dementia.[8]

IV. Functional independence: Ability to perform activities of daily living without assistance based on the self-reports of the study participants, responses given in an interview with a clinician, and the Barthel activities of daily living (BADL) index scores.[15]

Risk factors and covariates

Potential risk factors were recorded for each participant, including sex, age, body mass index (BMI), number of drugs used, marital status, comorbidities, educational level, alcohol consumption, and smoking status. Comorbidities were identified through self-reporting of physician-diagnosed diseases, and the comorbidity burden was calculated using the Deyo-Charlson comorbidity index (D-CCI).[16] The use of 5 drugs or more was accepted as polypharmacy. The Turkish version of the 15-item YGDS was used to screen depression.[17,18] Mini Nutritional Assessment Short Form was used to evaluate nutritional status, and a total score of < 12 points indicates undernutrition.[19]

Cognitive status was assessed using the MMSE, in which the total score ranges from 0 to 30.[20] Independence in performing activities of daily living was evaluated using the BADL index. This scale consists of 10 items that evaluate self-care, feeding, dressing, bathing, going to the toilet, stool control, urine control, transfer, and mobility activities. The possible total score ranges from 0 to 100. Higher scores indicate greater independence in performing activities of daily living.[21]

The anticholinergic drug burden was determined using the anticholinergic cognitive burden (ACB) scale.[22] The ACB scale provides an anticholinergic activity score for each regularly used drug: 0= absent, 1= possible, and 2 or 3= definite. The overall total score was obtained as the total of the scores for each drug. Accordingly, participants were classified as having ACB (total ACB score of 0) or ACB 1+ (total ACB score of ≥ 1).[22,23]

Statistical analysis

Statistical analyses were performed using IBM SPSS Statistics version 25.0 (IBM Corp., Armonk, NY, USA). Continuous variables were presented as means ± standard deviations, and categorical variables were presented as frequencies and percentages. The conformity of data to a normal distribution was examined using histograms and the Kolmogorov-Smirnov test. In the comparisons of individuals with and without MCRS, the independent samples t-test or the Mann-Whitney U test was used for continuous variables, and the chi-squared ($\chi 2$) test for categorical variables. MCRS status was the dependent variable in the logistic regression analyses. Covariates with $p \leq 0.10$ in the univariate analysis (age, sex, marital status, D-CCI, polypharmacy, and YGDS-15 score) and clinically meaningful variables (educational level) were entered into the full logistic regression model. The crude and adjusted results were presented as odds ratios (OR) and 95% confidence interval (CI). A value of $p < 0.05$ was accepted as statistically significant.

RESULTS

The records of a total of 1,352 individuals were reviewed, and 775 were excluded because they met at least one of the exclusion criteria or had missing data (Figure 1). Finally, 577 older adults with a mean age of 75.2 ± 6.2 (range, 65-98) years, average BMI of 29.4 kg/m^2, and median D-CCI of 4 were evaluated.

The overall incidence of MCRS was 7.8%, recording 9.9% and 7.8% in women and men, respectively. The median MMSE and gait speed scores were 28 and 0.95 m/s, respectively. The MCRS group was older ($p = 0.008$), predominantly female ($p = 0.015$), and unmarried ($p = 0.007$), had higher D-CCI scores ($p = 0.008$), engaged in polypharmacy ($p = 0.003$), and had higher YGDS scores ($p = 0.014$) than the non-MCRS group. The descriptive characteristics of the participants are presented in Table 1.

In the crude regression model, female sex (OR, 2.53; 95% CI, 1.19-5.35, $p = 0.016$), advanced age (OR, 2.41; 95% CI, 1.27-4.59, $p = 0.007$), being unmarried (OR, 2.38; 95% CI, 1.29-4.4, $p = 0.005$), higher D-CCI scores (OR, 1.37; 95% CI, 1.06-1.78, $p = 0.015$); polypharmacy (OR, 2.57; 95% CI, 1.39-4.75, $p = 0.003$), and higher YGDS score (OR, 1.15; 95% CI, 1.01-1.30, $p = 0.033$) were determined to be possible risk factors for MCRS.

In the fully adjusted model, advanced age (OR, 2.22; 95% CI, 1.04-4.71, $p = 0.039$), and polypharmacy (OR, 2.02; 95% CI, 1.02-3.99, $p = 0.043$) were determined to be risk factors for MCRS. Sex, marital status, education, D-CCI, and YGDS scores did not reach statistical significance in the model (Figure 2). The Hosmer-Lemeshow test provided an $\chi 2$ value of 7.26, which was not statistically significant ($p = 0.508$), demonstrating that the models were a good fit for the data.

DISCUSSION

MCRS remains an under-researched area in older adults. The results of the study revealed that the overall incidence of MCRS in the analyzed population was 7.8% in participants who did not have a significant health problem that affected gait speed and cognitive status. Even after controlling for variables, polypharmacy and advanced age were found to be risk factors for MCRS. The factors most strongly associated with MCRS have important implications for clinical practice, which may help reduce the risk of cognitive disorders.

The findings of this study are consistent with the rates of 3.5-15% reported in developing countries.[24-28] In line with these results, a recent meta-analysis of 26,802 older adults from 17 countries revealed a global MCRS incidence of 9.7%, ranging from 2% to 15%.[29] The variation in the incidence of MCRS could be due to the sociodemographic features of the population analyzed, age range, sex distribution, sample size, and criteria used to identify slow gait.[29,30] For example, the highest incidence of MCRS (15%) was

TABLE 1. Characteristics of the Study Population.

Variables	Total (n = 577)	With MCRS (n = 45)	Without MCRS (n = 532)	*p* value
Demographic and clinical data				
Sex (female), n (%)	362 (62.7)	36 (80)	326 (61.3)	**0.015**
Age group, n (%)				
65-75 years	306 (53)	15 (33.3)	291 (54.7)	**0.008**
> 75 years	271 (47)	30 (66.7)	241 (45.3)	
Marital status (married), n (%)	392 (67.9)	22 (48.9)	370 (69.5)	**0.007**
Education, ≤ 5 years	319 (55.3)	31 (68.9)	288 (54.1)	0.121
Current smokers, (yes), n (%)	27 (4.7)	0 (0)	27 (5.1)	0.257
Current drinkers, (yes), n (%)	7 (1.2)	0 (0)	7 (1.3)	1.000
BMI (kg/m^2), median (IQR)	29.4 (8.9)	28.7 (6.9)	29.4 (9.1)	0.254
Obesity (BMI ≥ 30 kg/m^2), n (%)	237 (41.1)	15 (33.3)	222 (41.7)	0.409
Hypertension, n (%)	407 (70.5)	35 (77.8)	372 (69.9)	0.310
Diabetes mellitus, n (%)	188 (32.6)	17 (37.8)	171 (32.1)	0.508
Coronary artery disease, (yes) n (%)	129 (22.4)	12 (26.7)	117 (22)	0.459
D-CCI, median (IQR)	4 (1)	4 (2)	4 (1)	**0.008**
Geriatric syndromes				
Polypharmacy (≥ 5 drugs)	199 (34.5)	25 (55.6)	174 (32.7)	**0.003**
ACB_1+	170 (29.5)	17 (37.8)	153 (28.8)	0.233
Gait speed (m/s), median (IQR)	0.95 (0.4)	0.63 (0.2)	0.98 (0.4)	**<0.001**
YGDS-15 score, median (IQR)	2 (3)	3 (3)	2 (3)	**0.014**
Minor depression, n (%)	82 (14.2)	8 (17.8)	74 (13.9)	0.351
MMSE score, median (IQR)	28 (2)	27 (2)	28 (2)	**<0.001**
Malnutrition risk	51 (8.8)	5 (11.1)	46 (8.6)	0.574

Data are shown as means and standard deviations for continuous variables and as n (%) for categorical variables.
ACB, anticholinergic cognitive burden; BMI, body mass index; D-CCI, Deyo-Charlson comorbidity index; IQR, interquartile range; MCRS, motoric cognitive risk syndrome; MMSE, mini-mental state examination; MNA-SF, mini nutritional assessment short form; YGDS-15, 15-item Yesavage geriatric depression scale.
Missing values: Malnutrition risk (5), obesity (46), minor depression (18), educational level (8).

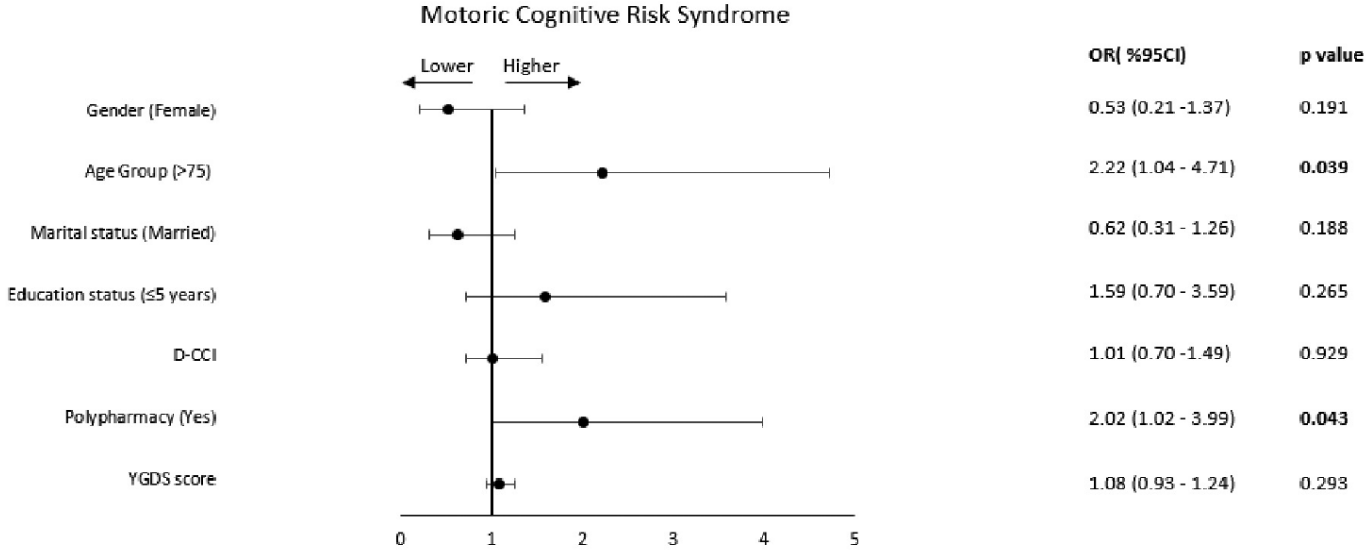

FIG. 2. Forest plot graph of the multivariate regression of associated factors with motoric cognitive risk syndrome.
Estimated odds ratios were given with 95% confidence intervals. D-CCI, Deyo-Charlson comorbidity index; MCRS, motoric cognitive risk syndrome; YGDS, Yesavage geriatric depression scale

found in an Indian cohort[24] with only memory complaints, wider age range (60-92 years), and smaller sample size (n = 271). The lowest incidence (3.5%) was determined in a Malaysian study, and the difference was attributed to the participant characteristics, that is, most of the study subjects were female (74.5%) and lived in rural areas (72.3%).[25] Compared with the present study, another study conducted in Mexico reported that 40% of the analyzed cohort had depression, and the incidence of MCRS was 14.3%.[28] Given the obvious risk of progression from MCRS to cognitive disorders, an internationally standardized method for MCRS screening appears to be needed.

Similar to the present study, previous studies have shown that advanced age is an important risk factor for MCRS.[25,28,29,31] The fact that aging-related sensory and motor loss, nervous system changes, and lifestyle modifications cause a decrease in gait speed and cognitive abilities contributes to the increased risk of MCRS at an older age.[32,33] The evaluation of older adults in terms of MCRS and the identification of individuals with MCRS are important in the development of preventive approaches in the predementia period.

The findings of the present study suggested that polypharmacy increased the incidence of MCRS twofold after adjusting for potential confounding factors. Similarly, in a study of 1,119 older adults, those with polypharmacy were seen to be 1.8-fold more likely to meet the MCRS criteria than those without polypharmacy.[34] In another study, each unit increase in polypharmacy was associated with a 53.8% increase in the risk of developing MCRS during the 4-year follow-up.[35] Polypharmacy can increase the risk of cognitive disorders, including delirium,[36] MCI,[37] and dementia,[38] in addition to its association with slow gait speed.[37,39] Moreover, polypharmacy was considered a probable risk factor for MCRS because of its effects on brain metabolism or structure, which can lead to various consequences in older people, including gait and cognitive deficits.[34] Therefore, given that treatment options are limited after dementia onset, preventive strategies should be implemented to avoid polypharmacy, which is a modifiable risk factor for unfavorable consequences in older adults at risk of dementia.

To our knowledge, this is the first study to have investigated the incidence of MCRS in Türkiye. In addition, the exclusion of significant health problems that affect cognitive status and physical abilities, which are common in older adults, has allowed the understanding of MCRS risk factors in relatively healthy older adults. Nevertheless, this study has some limitations. First, the true causal relationship could not be determined because of the cross-sectional design and the lack of long-term follow-up of the participants. Second, the retrospective design could have resulted in missing data and selection bias. Finally, the single-center setting limits the generalizability of the results.

In conclusion, MCRS is expected to become a more serious health issue as the older population continues to increase in Türkiye. The results of this study demonstrated that advanced age and polypharmacy were the strongest clinical variables associated with MCRS. Therefore, the evaluation of MCRS and management of polypharmacy in community-dwelling older people will be critical for the identification of older adults at risk of dementia and the improvements in the quality of care. However, further longitudinal studies with large samples are needed to evaluate MCRS and related factors to reduce the growing burden of dementia before its onset.

Ethics Committee Approval: University of Health Sciences Türkiye, Gülhane Scientific Research Ethics Committee, (decision number: 2023-185).

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Authorship Contributions: Concept- S.D., S.K.D., M.İ.N.; Design- S.D., S.K.D., M.İ.N.; Data Collection or Processing- S.D., S.K.D., M.İ.N.; Analysis or Interpretation- S.D., S.K.D., M.İ.N.; Literature Search- S.D., S.K.D., M.İ.N.; Writing- S.D., S.K.D., M.İ.N.

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