Rural-Urban Disparities in Mild Cognitive Impairment Prevalence, Related Chronic Health Conditions and Health Behaviors in the Republic of Armenia

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Background

Armenia is a post-Soviet, upper-middle-income country (UMIC) in the South Caucasus with a sharply growing aging population.

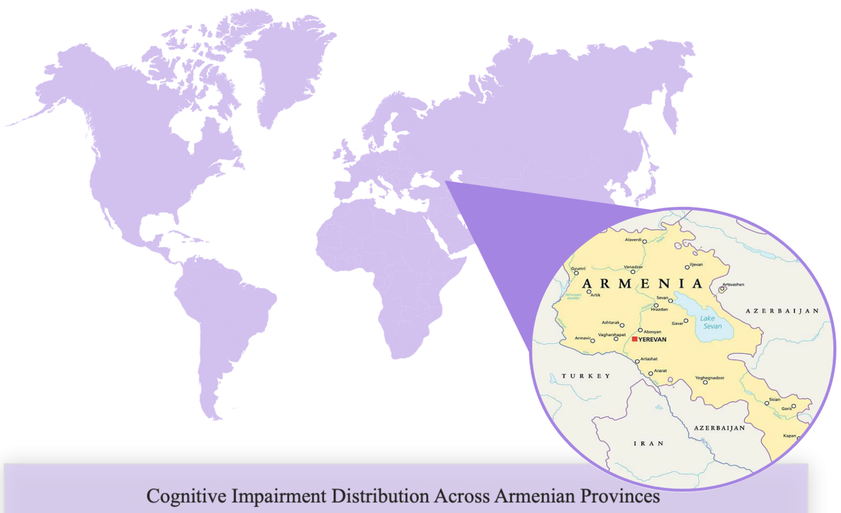
Rural communities in Armenia experience disproportionate health disparities, primarily driven by poverty, which affects approximately 36% of the rural population. Underdeveloped rural infrastructures also limit access to healthcare and essential services, as evidenced by the relatively low physician density of 48.6 per 10,000 people in 2020.

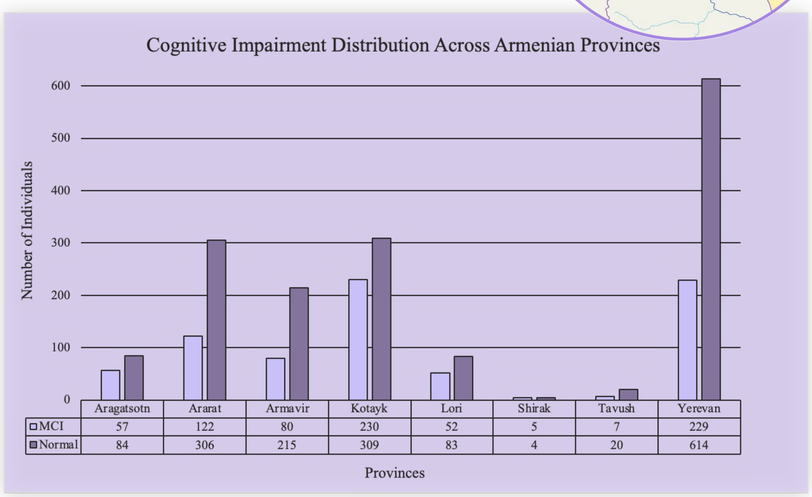
While research on dementia and cognitive impairment (CI) in Armenia is very limited, global studies conducted in similar UMICs show that rural populations face significantly higher rates of mild cognitive impairment (MCI) and greater socioeconomic, educational, and healthcare-related disparities. However, the association between MCI and these environmental influences is widely understudied. Interestingly, a study conducted in neighboring, post-Soviet Georgia found a 13% MCI prevalence among adults over 40 that was significantly associated with age (65+), male gender, rural residence, low education, diabetes, and hypertension.

Considering the overwhelming proportion of non-communicable diseases (NCDs)-related mortality and widespread lack of awareness for CI and dementia in Armenia, this study fulfills an urgent need to investigate the links between lifestyle risk factors and cognitive decline. Addressing these associations is crucial for developing targeted interventions to mitigate the growing age-related health challenges in Armenia.

Objective

This study explores the prevalence of mild cognitive impairment (MCI) in rural and urban Armenia, examining key demographic, health, and lifestyle factors that may contribute to cognitive health disparities. It aims to identify underlying patterns and inform targeted interventions to support cognitive well-being across diverse populations.





Results

- Among the full sample, MoCA scores indicated the following cognitive levels: 62.9% normal cognition, 30.1% mild cognitive impairment (MCI), 5.8% moderate cognitive impairment and 1.2% severe cognitive impairment.
- Of 2,426 included individuals, 1,681 were rural residents and 920 urban residents, 79.1% were female (N= 1918) and mean age was 64.78 (SD= 6.93).
- MCI was associated with rural residence (OR=1.45 [1.21, 1.75]). Furthermore, multiple logistic regression on full sample of MCI participants revealed statistically significant independent effects of sex ($p<0.01$), age ($p<0.01$), residence type ($p<0.01$), history of diabetes ($p=0.05$), hearing loss ($p<0.01$), and sleep difficulty ($p=0.03$) on MCI.
- Univariate analyses revealed that participants of both urban and rural residence who reported hypertension, hearing loss and heart disease had greater risk of MCI. However, association between greater risk of MCI and alcohol use (OR=1.89 [1.04, 3.46]) was found only in urban populations while association between greater risk of MCI with depression (OR=1.25 [1.01, 1.54]), history of head injury (OR=1.54 [1.14, 2.09]), and sleep difficulty (OR=1.41 [1.14, 1.75]) was found only in rural populations.

Table 1. Association of Health Behaviors and Chronic Illnesses to MCI in Rural Residents

Characteristics	N	OR (95% CI)	p-value	adj. OR (95% CI)	p-value
Age					
	1690 (100%)	-	-	1.07 (1.05, 1.09)	<0.001*
Sex					
Female	372 (22.0%)	ref.		ref.	
Male	1318 (78.0%)	1.58 (1.24, 2.01)	<0.001*	1.35 (0.97, 1.87)	0.08
Diabetes					
No	1267 (75.0%)	ref.		ref.	
Yes	423 (25.0%)	1.42 (1.13, 1.80)	0.003*	1.14 (0.87, 1.48)	0.34
Head Injury[a]					
No	1471 (87.0%)	ref.		ref.	
Yes	218 (12.9%)	1.54 (1.14, 2.09)	0.005*	1.32 (0.94, 1.85)	0.11
Depression					
No	1001 (59.2%)	ref.		ref.	
Yes	689 (40.8%)	1.25 (1.01, 1.54)	0.04*	1.16 (0.91, 1.46)	0.23
Sleep Difficulty					
No	972 (57.5%)	ref.		ref.	
Yes	718 (42.5%)	1.41 (1.14, 1.75)	0.001*	1.26 (0.99, 1.59)	0.056
Smoking[a]					
No	1528 (90.4%)	ref.		ref.	
Yes	161 (9.5%)	1.03 (0.73, 1.46)	0.88	0.85 (0.53, 1.35)	0.49
Alcohol Use[a]					
No	1547 (91.5%)	ref.		ref.	
Yes	142 (8.4%)	1.32 (0.92, 1.89)	0.13	1.22 (0.78, 1.91)	0.39
Hypertension					
No	759 (44.9%)	ref.		ref.	
Yes	931 (55.1%)	1.28 (1.04, 1.58)	0.02*	1.08 (0.85, 1.37)	0.54
Hearing Loss					
No	1156 (68.4%)	ref.		ref.	
Yes	534 (31.6%)	1.70 (1.36, 2.12)	<0.001*	1.34 (1.05, 1.71)	0.021*
Heart Disease					
No	928 (54.9%)	ref.		ref.	
Yes	762 (45.1%)	1.27 (1.03, 1.56)	0.02*	1.03 (0.81, 1.31)	0.81
≤ 12 years of Education					
No	550 (32.5%)	ref.		ref.	
Yes	1140 (67.5%)	5.17 (3.94, 6.77)	<0.001*	4.56 (3.45, 6.02)	<0.001*

[a]Missing value (1)
**107 individuals missing CI status

Among rural residents, age ($p<0.001$), education ($p<0.001$), hearing loss ($p=0.02$) were significantly associated with MCI such that **those of older age (OR=1.07 [1.05, 1.09]), less than 12 years of education (OR=4.56 [3.45, 6.02]) and presence of hearing loss (OR=1.34 [1.04, 1.71]) were more likely to present with MCI.**

Table 2. Association of Health Behaviors and Chronic Illnesses to MCI in Urban Residents

Characteristics	N	OR (95% CI)	p-value	adj. OR (95% CI)	p-value
Age					
	920 (100%)	-	-	1.11 (1.08, 1.14)	<0.001
Sex					
Female	179 (19.5%)	ref.		ref.	
Male	741 (80.5%)	1.91 (1.33 2.75)	<0.001*	1.86 (1.08, 3.20)	0.024*
Diabetes					
No	737 (80.1%)	ref.		ref.	
Yes	183 (19.9%)	1.65 (1.15, 2.36)	0.006*	1.20 (0.78, 1.86)	0.41
Head Injury					
No	800 (87.0%)	ref.		ref.	
Yes	120 (13.0%)	1.23 (0.79, 1.91)	0.36	0.87 (0.52, 1.46)	0.59
Depression					
No	509 (55.3%)	ref.		ref.	
Yes	411 (44.7%)	1.16 (0.86, 1.58)	0.33	1.02 (0.71, 1.47)	0.93
Sleep Difficulty					
No	499 (54.2%)	ref.		ref.	
Yes	421 (45.8%)	1.16 (0.85, 1.58)	0.34	1.04 (0.73, 1.47)	0.85
Smoking					
No	817 (88.8%)	ref.		ref.	
Yes	103 (11.2%)	1.30 (0.81, 2.06)	0.27	0.77 (0.37, 1.58)	0.47
Alcohol Use					
No	868 (94.3%)	ref.		ref.	
Yes	52 (5.7%)	1.89 (1.04, 3.46)	0.04*	1.58 (0.72, 3.47)	0.25
Hypertension[a]					
No	478 (52.0%)	ref.		ref.	
Yes	441 (47.9%)	1.53 (1.13, 2.08)	0.006*	0.99 (0.67, 1.46)	0.95
Hearing Loss					
No	706 (76.7%)	ref.		ref.	
Yes	214 (23.3%)	2.60 (1.83, 3.67)	<0.001*	1.23 (0.81, 1.86)	0.33
Heart Disease					
No	518 (56.3%)	ref.		ref.	
Yes	402 (43.7%)	1.88 (1.39, 2.56)	<0.001*	1.43 (0.97, 2.10)	0.07
≤ 12 years of Education					
No	377 (41.0%)	ref.		ref.	
Yes	543 (59.0%)	4.85 (3.37, 6.99)	<0.001*	5.01 (3.35, 7.50)	<0.001*

[a]Missing value (1)
**77 individuals missing CI status

Among urban residents age ($p<0.001$), education ($p<0.001$), sex ($p=0.02$) were significantly associated with MCI such that **those of older age (OR=1.11 [1.08, 1.14]), less than 12 years of education (OR=5.01 [3.35, 7.50]) and males (OR=1.86 [1.08, 3.20]) were more likely to present with MCI.**

Methods

- Study consisted of secondary data analysis utilizing a sample of 2,610 older adults (aged 55-93)* from 8 rural and urban provinces in Armenia who participated in a population-based early-detection cognitive impairment study. Conducted from July 2022 to May 2023, screenings utilized the Montreal Cognitive Assessment (MoCA) and a Health Characteristic Questionnaire to assess self-reported health behaviors and chronic conditions (e.g. history of diabetes, hypertension, heart disease, head injuries, depression, hearing loss, poor sleep quality, tobacco and alcohol use).
- Statistical analyses included χ^2-tests and multiple logistic regression to highlight the differences in association between MCI and participant health behaviors and chronic conditions across participants of rural and urban residences, both collectively and comparatively.
- Written informed consent was collected from all participants and ethical approval was obtained from the Avdalbekyan National Institute of Health Ethics Committee.

*184 individuals excluded due to Severe and Moderate Cognitive Impairment status

Discussion

- Higher likelihood of MCI in rural residents
- In unadjusted analysis, a greater number of health-related behaviors were associated with MCI presence
- Adjusted statistical model highlights the potential that disparities in healthcare access and stigma across rural/urban communities may not have as large of an impact on MCI presence as expected
- Strengths
  - First study to report differences among urban and rural communities in the Armenian population
  - Diverse representation of communities across 8 provinces of Armenia
  - Cost-effectiveness, extensive reach and feasible design of mobile early detection cognitive screenings in low-resource settings that lack health infrastructure to support brain health
- Limitations
  - Sample size is mostly women (selection bias)
  - Self-report nature to capture participant health information
  - All health information were binary variables, reducing dimensionality of predictors

Conclusions

- Highlighting the need for:
  - Public health initiatives designed for aging rural communities
  - Health governance entities to adopt sustainable infrastructure and develop dementia prevention programs tailored to the unique characteristics of rural communities
  - Increasing cognitive screenings at the provider level and increasing provider education for cognitive impairment screenings
  - Improving overall awareness and social acceptance of cognitive impairment in Armenia
  - Increasing public health education and visibility about improvement in lifestyle choices (cognitive stimulation, diet, exercise) to help reduce risk of cognitive decline

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