ORIGINAL RESEARCH

DOI: 10.4274/ejgg.galenos.2024.2024-10-2
Eur J Geriatr Gerontol 2025;7(1):21-28

The Impact of Anticholinergic Burden on Geriatric Syndromes: Screening in Community-Dwelling Older Adults

Deniz Mut Sürmeli[1], Remzi Bahşi[2], Çağlar Coşarderelioğlu[1], Tuğba Turgut[3], Hande Selvi Öztorun[4], Murat Varlı[1]

[1]Ankara University Faculty of Medicine, İbni Sina Research and Practice Hospital, Department of Geriatrics, Ankara, Türkiye
[2]University of Health Sciences Türkiye, Samsun Training and Research Hospital, Clinic of Geriatrics, Samsun, Türkiye
[3]University of Health Sciences Türkiye, Antalya Training and Research Hospital, Clinic of Geriatrics, Antalya, Türkiye
[4]Ankara Bilkent City Hospital, Clinic of Geriatrics, Ankara, Türkiye

Abstract

Objective: Anticholinergic burden (ACB) could be an important factor that may exacerbate or contribute to geriatric syndromes in older adults. Our objective was to examine the prevalence of ACB and the relationship between ACB and geriatric syndromes among community-dwelling older adults focusing on commonly used medications with anticholinergic side effects.

Materials and Methods: In this cross-sectional study, community-dwelling older adults aged 60 years and above, residing in Altındağ, Ankara, Türkiye, were screened. Comprehensive geriatric assessment was applied to all participants, and their ACB scores were calculated using the Anticholinergic Cognitive Burden Scale. The participants were then categorized as no ACB (score =0), low ACB (score =1), and high ACB (score ≥2).

Results: Five hundred twenty one participants (median age: 68 years) were included. The prevalence of high ACB was 7.5%, with anticholinergic medication use observed in 24.6% of community-dwelling older adults. The three most prevalent drugs with anticholinergic effects used among participants were metoprolol, colchicine, and warfarin. A high ACB was significantly associated with various geriatric syndromes, including polypharmacy (p<0.001), urinary incontinence (p=0.046), frailty (p<0.001), probable sarcopenia (p<0.001), cognitive dysfunction (p=0.015), and depression (p<0.001). In multivariate logistic regression analysis, after adjusting for age and the Charlson Comorbidity Index, polypharmacy and frailty remained significant predictors of high ACB [odds ratio (OR)=5.317, p≤0.001 and OR=3.042, p=0.002].

Conclusion: A high ACB score was associated with a greater number of geriatric syndromes, particularly increasing the risk of polypharmacy and frailty among community-dwelling older adults. Cardiovascular medications made a significant contribution to the ACB in this population. Regular medication reviews, along with deprescribing or substituting drugs with anticholinergic effects, when possible, may help reduce the risk of developing geriatric syndromes, especially in frail older adults.

Keywords: Cholinergic antagonists, geriatric assessment, frailty, polypharmacy, deprescription

Introduction

Geriatric syndromes are complex health problems that develop from multiple system impairments, making older adults vulnerable to specific challenges (1). Traditional disease frameworks typically address problems within a single organ, but geriatric syndromes involve a variety of conditions like frailty, incontinence, falls, sarcopenia, and cognitive impairment that do not conform to specific disease categories. Having one or more geriatric syndromes is linked to adverse outcomes, including higher morbidity rates, prolonged hospital stays, increased healthcare expenses, diminished quality of life, and greater levels of dependency (2,3).

Anticholinergic burden (ACB) describes the cumulative impact of using multiple medications with anticholinergic effects (4). These medications interact with the muscarinic acetylcholine receptors, affecting the central and peripheral nervous systems

Address for Correspondence: Deniz Mut Sürmeli, MD, Ankara University Faculty of Medicine, İbni Sina Research and Practice Hospital, Department of Geriatrics, Ankara, Türkiye
E-mail: denizmut19@yahoo.com **ORCID:** orcid.org/0000-0002-3913-1046
Received: 10.04.2024 **Accepted:** 02.12.2024 **Publication Date:** 28.03.2025

Cite this article as: Mut Sürmeli D, Bahşi R, Coşarderelioğlu Ç, Turgut T, Selvi Öztorun H, Varlı M. The impact of anticholinergic burden on geriatric syndromes: screening in community-dwelling older adults. Eur J Geriatr Gerontol. 2025;7(1):21-28

and leading to various side effects throughout the body (5). In terms of their impact on the central nervous system, these medications may even induce cognitive impairment, confusion, delirium, and elevate the risk of developing dementia. Conversely, on a peripheral level, they can cause dry mouth, constipation, urinary retention, impaired sweating, tachycardia, and blurred vision (6). These side effects present substantial risks, especially in older adults. Their vulnerability to these outcomes is affected by age-related physiological changes, such as increased blood-brain permeability, decreased acetylcholine receptors, reduced anticholinergic clearance, and a higher likelihood of polypharmacy (7,8). Moreover, a high ACB in older adults has been associated with elevated rates of falls, hospitalizations, and mortality (9,10). Given that geriatric syndromes often result in similar outcomes, it is possible that a high ACB not only exacerbates, but also contributes to the development of these syndromes.

In clinical practice, the ACB can be assessed using various scales that assign points to medications based on their anticholinergic activity (11). While these scales may differ in their scoring, antidepressants, medications for urinary incontinence, and antipsychotics consistently receive high anticholinergic scores (6). These medications are often used to manage symptoms of geriatric syndromes such as depression, urinary incontinence, and delirium, either individually or in combination with other drugs. Although their use can lead to a high ACB and potential side effects, these medications are sometimes necessary since effectively managing these symptoms can substantially enhance the well-being and functional abilities of certain older patients. Therefore, it may be necessary to assess the risks and benefits of prescribing anticholinergic medications to older patients by evaluating the ACB within this population.

Numerous studies have assessed the ACB among older adults using multiple scales. However, most of these studies have focused on older individuals with specific diseases, either as outpatients or in hospital settings, when they require acute care. In our study, we investigated the prevalence of ACB among community-dwelling older adults, with a particular focus on commonly used medications with anticholinergic side effects. Additionally, we sought to investigate the connection between ACB and geriatric syndromes, considering their common significant outcomes in this population.

Materials and Methods

This cross-sectional study, designed to screen community-dwelling older adults, was conducted between January 2019 and June 2019. The study was announced by the municipality of Altındağ, a district in Ankara, Türkiye, inviting individuals who wished to participate. Participants were required to attend a designated location for examination. The inclusion criteria were being 60 years or older, having knowledge of their medications, and bringing them to the examination. Individuals were excluded if they had communication problems that made them unable to comprehend the study materials or answer the questions. This study adhered to the principles of the Declaration of Helsinki and obtained ethical approval from Ankara University's Ethical Committee (approval number: 11-747-18, date: 25.06.2018).

Evaluation of Participants

The participants were evaluated by geriatricians and internal medicine doctors from Ankara University Faculty of Medicine. Patient demographics, including age, place of residence, comorbidities, and medications, were recorded. The Charlson Comorbidity Index (CCI) was calculated to assess the patients' comorbidity burden (12).

Height, weight, handgrip strength, and gait speed were measured for all participants. Handgrip strength (kg) was measured using an electronic hand dynamometer (Takei Scientific Instruments, Niigata, Japan). Patients were seated with their elbow flexed at a 90-degree angle and instructed to squeeze the dynamometer as forcefully as possible. Measurements were taken three times for each hand, allowing sufficient rest between each trial. The highest value obtained from these measurements was recorded as the final handgrip strength. Gait speed was determined by the time taken to walk 4 meters, with the corresponding speed calculated in meters per second. Low muscle strength was identified as handgrip measurements below 32 kg for men and below 22 kg for women, and low physical performance was characterized by a gait speed of less than 0.8 m/s (13).

Polypharmacy was defined as using at least 5 medications. Dependency was defined if participants showed dependency in at least one area on the Katz activities of daily living (ADL), with a maximum score of 6, or Lawton instrumental activities of daily living (IADL), with a maximum score of 8 (14,15). A score of 21 or lower on the mini-mental status examination (MMSE), selected in this study to account for the limited education levels within our sample that can affect MMSE performance, indicated cognitive impairment (16). Meanwhile, a score of 5 or higher on the Yesavage Geriatric Depression Scale (GDS) suggested depression (17). Based on Fried Frailty Index scores, participants were categorized as robust (0 points), prefrail (1-2 points), or frail (3-5 points) (18). Fall histories in the last year and presence of urinary incontinence in the last 3 months were recorded. Nutritional status was classified as normal (12-14 points), at risk of malnutrition (8-11 points), or malnourished (0-7 points) according to the short form of the Mini-Nutritional Assessment tool Scores (19). Individuals scoring between 4 and 10 on the SARC-F and exhibiting low muscle strength, as described above, were classified as having probable sarcopenia (20,21).

Determining ACB Scores

We utilized the updated "Anticholinergic Cognitive Burden Scale" to determine the ACB scores of participants based on their medications (22,23). The anticholinergic effects of medications taken by each participant for at least 3 months were evaluated and scored according to this scale. The participants were then categorized as no ACB (score =0), low ACB (score =1), and high ACB (score ≥2).

Statistical Analysis

Statistical analyses were conducted using PASW Statistics (version 18.0. Chicago: SPSS Inc.). Counts and percentages were used to summarize categorical variables, while continuous variables were summarized using medians and interquartile ranges (IQR). Patient categorization was based on their ACB score (0, low, or high). Categorical variables were compared using the chi-square test, while continuous variables were assessed using the Kruskal-Wallis test for multiple group comparisons. Multivariate logistic regression analysis was performed to assess parameters associated with a high ACB score, and odds ratios were calculated. Statistical significance was set at $p<0.05$.

Results

Of the 608 individuals who applied to participate in the study, 521 met the criteria and were included. Table 1 provides details on the characteristics of the study participants and the distribution of ACB scores. The participants had a median age of 68 years (IQR 65-72). The age distribution revealed that 61% were aged 60-69 years, 34.9% were aged 70-79 years, and 4% were aged 80 years or older. Females constituted 63% (n=328) of the participants, while males accounted for 37% (n=193). The median BMI was 31.1 (IQR 28-35). Regarding comorbidities, the median CCI was 3 (IQR 2-4). The most prevalent comorbidities included hypertension (58.2%), diabetes mellitus (29.4%), and coronary artery disease (17.5%). One hundred and twenty-eight participants (24.6%) were taking at least one anticholinergic medication. The ACB scores were distributed as follows: 75.4% of participants had a score of 0, 17.1% had a low score, and 7.5% had a high score.

Table 2 presents the association between the ACB categories and patients' characteristics as well as geriatric syndromes. The median age increased slightly with higher ACB scores: 67 years (no ACB), 69 years (low ACB), and 69 years (high ACB), with a significant difference (p=0.040). The CCI scores were also significantly higher in the high ACB group (median of 4) compared to the no ACB (median of 3) and low ACB (median of 3) groups ($p<0.001$). While the median Katz ADL and Lawton IADL Scores were similar across the groups, individuals with higher ACB scores tended to have slightly lower functional scores, indicating greater dependence. Statistically significant differences were observed for both measures ($p<0.001$ for both measures). The number of medications was significantly higher in the high ACB group (median of 6) compared to the no ACB (median of 2), and low ACB (median of 5) groups ($p<0.001$). The number of geriatric syndromes also increased significantly with higher ACB scores, with a median of 4 in the high ACB group, 2 in the low ACB group, and 1 in the no ACB group ($p<0.001$). Polypharmacy and urinary incontinence were most

Table 1. Characteristics of study participants and Anticholinergic Burden Score distribution

	All participants
Age (median)	68 (65-72)
60-69 years (n, %)	318 (61%)
70-79 years (n, %)	182 (34.9%)
≥80 years (n, %)	21 (4%)
Female (n, %)	328 (63%)
Male (n, %)	193 (37%)
Education status	
Illiterate	122 (23.4%)
Literate	71 (13.6%)
Primary school graduate	220 (42.2%)
Middle school graduate	39 (7.5%)
High school graduate	51 (9.8%)
University graduate	18 (3.5%)
BMI (median)	31.1 (28-35)
CCI (median)	3 (2-4)
Comorbidities (n, %)	
Hypertension	303 (58.2%)
Diabetes mellitus	153 (29.4%)
Coronary artery disease	91 (17.5%)
Heart failure	12 (2.3%)
Cerebrovascular disease	11 (2.1%)
Chronic kidney disease	3 (0.6%)
Dementia	3 (0.6%)
Chronic pulmonary obstructive disease	8 (1.5%)
Depression	30 (5.8%)
Number (%) of patients on anticholinergic meds	128 (24.6%)
Number (%) of patients on at least 2 anticholinergic meds	23 (4.5%)
Number (%) of patients on at least 3 anticholinergic meds	5 (1%)
Number (%) of patients on ≥4 anticholinergic meds	1 (0.2%)
ACB Score (n, %)	
ACB Score 0	393 (75.4%)
ACB Score 1 (low)	89 (17.1%)
ACB Score ≥2 (high)	39 (7.5%)

The values are shown as counts and percentages (%)
BMI: Body Mass Index, CCI: Charlson Comorbidity Index, ACB: Anticholinergic burden

Table 2. Anticholinergic Burden Score categories according to participants' characteristics and geriatric syndromes

	No ACB (ACB Score =0) (n=393, 75.4%)	Low ACB (ACB Score =1) (n=89, 17.1%)	High ACB (ACB Score ≥2) (n=39, 7.5%)	p
Age (median)	67 (65-72)	69 (66-71)	69 (65-74)	**0.040**
Female (n, %)	238 (60.6%)	58 (65.2%)	32 (82.1%)	**0.027**
Male (n, %)	155 (39.4%)	31 (34.8%)	7 (17.9%)	
BMI (median)	30.8 (27.7-34.7)	31.7 (28.7-34.6)	34.4 (29-37.5)	**0.043**
CCI (median)	3 (2-4)	3 (3-4)	4 (3-5)	**<0.001**
Katz ADL (median)	6 (6-6)	6 (5-6)	6 (5-6)	**<0.001**
Lawton IADL (median)	8 (8-8)	8 (8-8)	8(7-8)	**<0.001**
Number of medications (median)	2 (1-4)	5 (3-6)	6 (4-8)	**<0.001**
Number of geriatric syndromes (median)	1 (1-2)	2 (1-4)	4 (2-5)	**<0.001**
Polypharmacy (n, %)	73 (18.6%)	50 (56.2%)	29 (74.4%)	**<0.001**
Urinary incontinence (n, %)	143 (36.4%)	36 (40.4%)	22 (56.4%)	**0.046**
Fall history (n, %)	93 (23.7%)	28 (31.5%)	14 (35.9%)	**0.107**
Frailty (n, %)				**<0.001**
Robust	167 (42.5%)	27 (30.3%)	6 (15.4%)	
Prefrail	166 (42.2%)	36 (40.4%)	13 (33.3%)	
Frail	60 (15.3%)	26 (29.2%)	20 (51.3%)	
Probable sarcopenia (n, %)	40 (10.2%)	20 (22.5%)	14 (35.9%)	**<0.001**
Muscle strength (kg) (median)	24.8 (19.1-33.3)	22.6 (17.6-30.3)	19.4 (14-24.1)	**<0.001**
Low muscle strength (n, %)	194 (49.6%)	49 (55.1%)	30 (76.9%)	**0.004**
Gait speed (m/s) (median)	0.57 (0.44-0.8)	0.66 (0.5-0.8)	0.5 (0.35-0.64)	**<0.001**
Low physical performance (n, %)	291 (74.8%)	55 (61.8%)	36 (92.3%)	**0.001**
MMSE Scores (n, %)				
≤21 points	51 (13%)	10 (11.2%)	7 (17.9%)	**0.015**
GDS Scores (n, %)				
≥5 points	133 (34%)	45 (50.6%)	23 (59%)	**<0.001**
MNA Scores (n, %)				0.447
Malnutrition risk	13 (3.3%)	4 (4.5%)	3 (7.7%)	
Malnutrition	2 (0.5%)	1 (1.1%)	0 (0%)	

The values are shown as counts and percentages (%) or medians (interquartile range).
ACB: Anticholinergic burden, ADL: Activities of daily living, BMI: Body Mass Index, CCI: Charlson Comorbidity Index, GDS: Geriatric Depression Scale, IADL: Instrumental activities of daily living, MMSE: Mini-mental state examination, MNA: Mini nutritional assessment

prevalent in the high ACB group (74.4% and 56.4%, respectively, p<0.001 and p=0.046). Frailty was significantly higher in the high ACB group, with 51.3% classified as frail compared to 15.3% in the no ACB group and 29.2% in the low ACB group (p<0.001). Probable sarcopenia and low muscle strength were more prevalent in the high ACB group (35.9% and 76.9%, respectively, p<0.001 and p=0.004). Gait speed was significantly slower in the high ACB group (median of 0.5 m/s) compared to the no ACB (0.57 m/s), and low ACB (0.66 m/s) groups (p<0.001). Low physical performance was also more prevalent in the high ACB group (92.3%) compared to the group no ACB (74.8%) and low ACB (61.8%) groups (p=0.001). GDS scores of ≥5, indicating depression, were significantly higher in the high ACB group (59%) compared to the no ACB (34%) and low ACB (50.6%) groups (p<0.001).

The list of drugs used by participants with anticholinergic effects and their ACB scores was provided in Table 3. Among the 451 participants taking at least one medication, the most commonly used drugs with anticholinergic effects included metoprolol (17.3%), colchicine (2%), warfarin (1.8%), and furosemide (1.6%). Among participants taking medication, thirty-one (6.8%) were using a medication with a score of 3 on the Anticholinergic Cognitive Burden Scale. The number of patients using anticholinergic drugs for each medication is shown in Figure 1.

Table 3. List of drugs used by participants with anticholinergic effects and their ACB Scores according to the Anticholinergic Cognitive Burden Scale

Medications with anticholinergic side effects	Number of participants (among those taking at least one medication) (n= 451)	Medication Scores on Anticholinergic Cognitive Burden Scale
Urinary incontinence medications		
Trospium	2 (0.4%)	3
Solifenacin	4 (0.9%)	3
Tolterodine	3 (0.7%)	3
Oxybutynin	1 (0.2%)	3
Fesoterodine	1 (0.2%)	3
Propiverine	1 (0.2%)	3
Antidepressants		
Paroxetine	3 (0.7%)	3
Amitriptyline	1 (0.2%)	3
Venlafaxine	1 (0.2%)	1
Trazodone	4 (0.9%)	1
Antipsychotics		
Quetiapine	4 (0.9%)	3
Olanzapine	1 (0.2%)	3
Risperidone	1 (0.2%)	1
Cardiovascular system medications		
Metoprolol	78 (17.3%)	1
Nifedipine	5 (1.1%)	1
Digoxin	2 (0.4%)	1
Captopril	1 (0.2%)	1
Warfarin	8 (1.8%)	1
Furosemide	7 (1.6%)	1
Isosorbide	5 (1.1%)	1
Gastrointestinal system medications		
Hyoscine butylbromide	3 (0.7%)	3
Dimenhydrinate	2 (0.4%)	3
Alverine	1 (0.2%)	1
Anti-inflammatory medications		
Prednisolone	1 (0.2%)	1
Colchicine	9 (2%)	1
Antihistamines		
Desloratadine	2 (0.4%)	1
Hydroxyzine	5 (1.1%)	3
Levocetirizine	2 (0.4%)	1
Cetirizine	2 (0.4%)	1
Others		
Carbamazepine	1 (0.2%)	2
Theophylline	3 (0.7%)	1

The values are shown as counts and percentages (%), ACB: Anticholinergic burden

After adjusting for age and the CCI, the multivariate logistic regression analysis indicated that polypharmacy (OR=5.317, 95% CI 2.303-12.275, p≤0.001) and frailty (OR=3.042, 95% CI 1.482-6.242, p=0.002) were strongly linked to higher odds of high ACB (Table 4).

Discussion

In this study, we found that the prevalence of high ACB among community-dwelling older adults was 7.5%. However, a notable 24.6% of participants were taking medications with anticholinergic properties. This prevalence is lower than the 55% to 65% rates reported among older adults in long-term care facilities and hospital outpatients, which can be explained by differences in ACB scales, residency areas, age, and functional status of participants (24-26). Our study participants had a relatively lower median age (68 years) and were more active, as indicated by high ADL and IADL scores, reflecting lower dependency. Similarly, a recent study found a 19% ACB prevalence among community-dwelling older adults aged 65 and above, aligning with our findings (27).

As people age, the number of comorbidities and medications they use increases, elevating their risk of polypharmacy and ACB (28). In our study, participants with a high ACB score were more likely to use multiple medications, have more comorbidities, and present with geriatric syndromes such as urinary incontinence, frailty, sarcopenia, cognitive dysfunction, and depression. It is not surprising that these conditions are associated with high ACB, given the frequent use of antimuscarinics and antidepressants for treatment. Even patients not using these medications may have a high ACB due to other drugs with anticholinergic properties, such as diuretics or beta-blockers, commonly used for managing comorbidities.

The most prevalent medications with anticholinergic effects in our study were metoprolol, colchicine, and warfarin. Cardiovascular drugs, including metoprolol, warfarin, and furosemide, were the most common category, followed by urinary incontinence drugs like solifenacin and antihistamines such as hydroxyzine. These findings are consistent with previous studies in older adults, particularly a study among elderly Turkish individuals aged 85 and above, which also identified metoprolol and furosemide as frequently used medications with anticholinergic properties (24).

The impact of anticholinergic drugs on cognitive function is well established, with studies showing that these medications can lead to dementia and cognitive decline (29). For instance, a two-year decline of 0.33 points in MMSE scores has been associated with anticholinergic medications, and even short-term use (>60 days) can double the risk of cognitive impairment (30,31). The mechanisms behind this effect are still unclear, but may involve increased amyloid-β accumulation and reduced brain

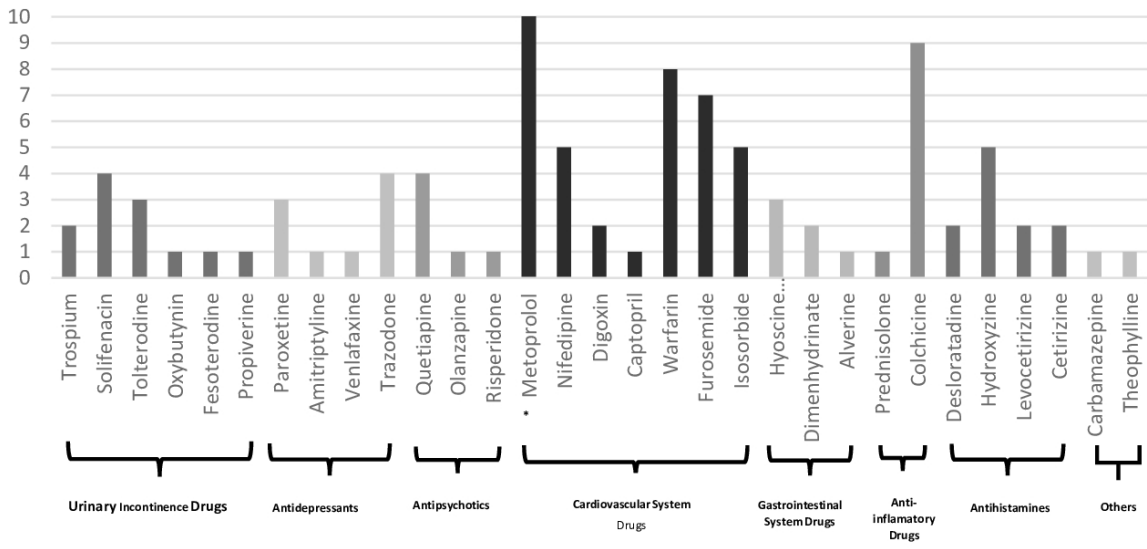

Figure 1. Number of participants based on the use of anticholinergic medications

*The y-axis scale is 0-10 for clarity; 78 participants were using metoprolol

Table 4. Results of univariate and multivariate analyses of factors associated with high ACB score

	Univariate			Multivariate		
Variable	**OR**	**95% CI**	**p**	**OR**	**95% CI**	**p**
Age (continuous)	1.034	0.976-1.095	0.260	0.978	0.912-1.048	0.529
CCI (continuous)	1.798	1.368-2.364	**<0.001**	1.291	0.906-1.841	0.158
Polypharmacy	8.464	4.009-17.871	**<0.001**	5.317	2.303-12.275	**<0.001**
Frailty	4.847	2.481-9.470	**<0.001**	3.042	1.482-6.242	**0.002**

The values are reported as odds ratios with 95% confidence intervals (CI).
CCI: Charlson Comorbidity Index, ACB: Anticholinergic burden

synapse numbers, contributing to Alzheimer's disease-related pathology and brain atrophy. In line with previous research, our data also indicate a higher prevalence of low MMSE scores among participants with higher ACB scores, which aligns with the existing evidence linking ACB to cognitive impairment.

Beyond cognitive decline, anticholinergic drugs have also been linked to falls, balance issues, and reduced physical activity in older adults (32,33). In our study, participants with high ACB scores showed increased dependency in ADL and IADL, decreased muscle strength, and slower gait speed. Probable sarcopenia was also highly prevalent in this group. These effects could be related to the anticholinergic impact on neuromuscular junctions, potentially disrupting movement and posture, contributing to muscle weakness and reduced physical activity, as seen in other studies (34,35).

Our findings suggest that polypharmacy and frailty are significant predictors of high ACB, even after adjusting for age and the CCI. Frailty is defined by a reduced physiological reserve and heightened susceptibility to negative health outcomes, including falls, disabilities, hospitalizations, nursing home admissions, and increased mortality (36). Frail older adults often have a high burden of comorbidities and concomitant geriatric syndromes, including malnutrition, cognitive dysfunction, and urinary incontinence (37). Therefore, they also may take an increased number of medications, leading to polypharmacy and a higher risk of high ACB (38). However, establishing a cause-and-effect relationship between frailty and high ACB is challenging, as high ACB can also contribute to low muscle strength, gait speed, weakness-all of which are components of frailty-ultimately leading to frailty.

Most studies on ACB focus on hospitalized or nursing home residents, but our study highlights the ACB among community-dwelling older adults. While antidepressants, antipsychotics, and urinary incontinence drugs are well-known for their high anticholinergic effects, our findings show that commonly used cardiovascular medications-such as metoprolol, furosemide, and warfarin-are the most prevalent contributors to the ACB in this population, despite having a lower ACB. This underscores the importance of being knowledgeable about which drugs have anticholinergic properties, regularly reviewing medications, and deprescribing anticholinergic medications when possible to improve outcomes for frail older adults. Reducing the ACB can

enhance cognition, mitigate adverse effects, improve quality of life, and help decrease the prevalence of geriatric syndromes.

Study Limitations

Our study has several limitations. The cross-sectional nature of the design restricts our ability to determine causality between ACB and geriatric syndromes. Additionally, we only assessed ACB using the Anticholinergic Cognitive Burden Scale, without considering the dosage or duration of medication use, which may also affect outcomes. Furthermore, the number of participants in the high ACB group was relatively low, limiting the generalizability of our findings. Another limitation is that we investigated probable sarcopenia based on SARC-F scores and low muscle strength, rather than diagnosing sarcopenia, as we did not directly measure muscle mass. Additionally, cognitive impairment was diagnosed using the MMSE rather than a comprehensive neuropsychological assessment.

Conclusion

In conclusion, high ACB was present in 7.5% of participants. Additionally, anticholinergic medication use was observed in 24.6% of community-dwelling older adults. Participants with a high ACB score exhibited a greater number of geriatric syndromes. A high ACB correlated with a heightened risk of polypharmacy and frailty within this population. Cardiovascular medications were the most commonly used drugs contributing to the ACB. There is a need for prospective studies to investigate the causal link between high ACB and geriatric syndromes in older adults.

Ethics

Ethics Committee Approval: This study adhered to the principles of the Declaration of Helsinki and obtained ethical approval from Ankara University's Ethical Committee (approval number: 11-747-18, date: 25.06.2018).

Informed Consent: Written informed consent was obtained from all participants prior to their inclusion in the study.

Footnotes

Authorship Contributions

Surgical and Medical Practices: D.M.S., R.B., Ç.C., T.T., H.S.Ö., M.V., Concept: D.M.S., M.V., Design: D.M.S., M.V., Data Collection or Processing: D.M.S., R.B., Ç.C., T.T., H.S.Ö., Analysis or Interpretation: D.M.S., M.V., Literature Search: D.M.S., R.B., T.T., Writing: D.M.S., M.V.,

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

References

1. Inouye SK, Studenski S, Tinetti ME, Kuchel GA. Geriatric syndromes: clinical, research, and policy implications of a core geriatric concept. J Am Geriatr Soc. 2007;55:780-791.
2. Kane RL, Shamliyan T, Talley K, Pacala J. The association between geriatric syndromes and survival. J Am Geriatr Soc. 2012;60:896-904.
3. Campbell SE, Seymour DG, Primrose WR, Lynch JE, Dunstan E, Espallargues M, Lamura G, Lawson P, Philp I, Mestheneos E, Politynska B, Raiha I, Acmeplus Project T. A multi-centre European study of factors affecting the discharge destination of older people admitted to hospital: analysis of in-hospital data from the ACMEplus project. Age Ageing. 2005;34:467-475.
4. Salahudeen MS, Duffull SB, Nishtala PS. Anticholinergic burden quantified by anticholinergic risk scales and adverse outcomes in older people: a systematic review. BMC Geriatr. 2015;15:31.
5. Bell B, Avery A. Identifying anticholinergic burden in clinical practice. Prescriber. 2021;32:20-23.
6. Ghossein N, Kang M, Lakhkar AD. Anticholinergic medications. 2020.
7. Bowie MW, Slattum PW. Pharmacodynamics in older adults: a review. Am J Geriatr Pharmacother. 2007;5:263-303.
8. Lee J, Kim HJ. Normal aging induces changes in the brain and neurodegeneration progress: review of the structural, biochemical, metabolic, cellular, and molecular changes. Front Aging Neurosci. 2022;14:931536.
9. Naharci MI, Tasci I. Frailty status and increased risk for falls: the role of anticholinergic burden. Arch Gerontol Geriatr. 2020;90:104136.
10. Gnjidic D, Hilmer SN, Hartikainen S, Tolppanen AM, Taipale H, Koponen M, Bell JS. Impact of high-risk drug use on hospitalization and mortality in older people with and without Alzheimer's disease: a national population cohort study. PLoS One. 2014;9:83224.
11. Lozano-Ortega G, Johnston KM, Cheung A, Wagg A, Campbell NL, Dmochowski RR, Ng DB. A review of published anticholinergic scales and measures and their applicability in database analyses. Arch Gerontol Geriatr. 2020;87:103885.
12. Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. J Chronic Dis. 1987;40:373-383.
13. Bahat G, Tufan A, Tufan F, Kilic C, Akpinar TS, Kose M, Erten N, Karan MA, Cruz-Jentoft AJ. Cut-off points to identify sarcopenia according to European Working Group on Sarcopenia in Older People (EWGSOP) definition. Clin Nutr. 2016;35:1557-1563.
14. Arik G, Varan HD, Yavuz BB, Karabulut E, Kara O, Kilic MK, Kizilarslanoglu MC, Sumer F, Kuyumcu ME, Yesil Y, Halil M, Cankurtaran M. Validation of Katz index of independence in activities of daily living in Turkish older adults. Arch Gerontol Geriatr. 2015;61:344-350.
15. Isik EI, Yilmaz S, Uysal I, Basar S. Adaptation of the lawton instrumental activities of Daily Living Scale to Turkish: validity and reliability study. Ann Geriatr Med Res. 2020;24:35-40.
16. Keskinoglu P, Ucku R, Yener G, Yaka E, Kurt P, Tunca Z. Reliability and validity of revised Turkish version of mini mental state examination (rMMSE-T) in community-dwelling educated and uneducated elderly. Int J Geriatr Psychiatry. 2009;24:1242-1250.
17. Durmaz B, Soysal P, Ellidokuz H, Isik AT. Validity and reliability of geriatric depression scale-15 (short form) in Turkish older adults. North Clin Istanb. 2018;5:216-220.
18. Fried LP, Tangen CM, Walston J, Newman AB, Hirsch C, Gottdiener J, Seeman T, Tracy R, Kop WJ, Burke G, McBurnie MA; Cardiovascular Health Study Collaborative Research Group. Frailty in older adults: evidence for a phenotype. J Gerontol A Biol Sci Med Sci. 2001;56:146-156.

19. Sarikaya D, Halil M, Kuyumcu ME, Kilic MK, Yesil Y, Kara O, Ozturk S, Gungor E, Karabulut E, Balam Yavuz B, Cankurtaran M, Ariogul S. Mini nutritional assessment test long and short form are valid screening tools in Turkish older adults. Arch Gerontol Geriatr. 2015;61:56-60.
20. Bahat G, Yilmaz O, Kilic C, Oren MM, Karan MA. Performance of SARC-F in regard to sarcopenia definitions, muscle mass and functional measures. J Nutr Health Aging. 2018;22:898-903.
21. Cruz-Jentoft AJ, Bahat G, Bauer J, Boirie Y, Bruyère O, Cederholm T, Cooper C, Landi F, Rolland Y, Sayer AA, Schneider SM, Sieber CC, Topinkova E, Vandewoude M, Visser M, Zamboni M; Writing Group for the European Working Group on Sarcopenia in Older People 2 (EWGSOP2), and the Extended Group for EWGSOP2. Sarcopenia: revised European consensus on definition and diagnosis. Age Ageing. 2019;48:16-31.
22. Campbell N, Maidment I, Fox C, Khan B, Boustani M. The 2012 update to the anticholinergic cognitive burden scale. Journal of the American Geriatrics Society. 2013;61:142-143.
23. Boustani M, Campbell N, Munger S, Maidment I, Fox C. Impact of anticholinergics on the aging brain: a review and practical application. 2008;02:311-320.
24. Özaydın FN. Frequency of single or combined anticholinergic medication usage as potentially inappropriate medications among the oldest-old age subgroup. 2024;34:43-49.
25. Grossi CM, Richardson K, Savva GM, Fox C, Arthur A, Loke YK, Steel N, Brayne C, Matthews FE, Robinson L, Myint PK, Maidment ID. Increasing prevalence of anticholinergic medication use in older people in England over 20 years: cognitive function and ageing study I and II. BMC Geriatr. 2020;20:267.
26. Hinkle CE, Davis JD, Arias I, Goldstein A, Daiello L, Margolis SA. Anticholinergic and sedative medication use in older patients with cognitive concerns. J Am Geriatr Soc. 2024;72:2792-2799.
27. Perdixi E, Cotta Ramusino M, Costa A, Bernini S, Conti S, Jesuthasan N, Severgnini M, Prinelli F, NutBrain Study G. Polypharmacy, drug-drug interactions, anticholinergic burden and cognitive outcomes: a snapshot from a community-dwelling sample of older men and women in northern Italy. Eur J Ageing. 2024;21:11.
28. Okudur SK, Dokuzlar O, Aydin AE, Kocyigit SE, Soysal P, Isik AT. The evaluation of relationship between polypharmacy and anticholinergic burden scales. North Clin Istanb. 2021;8:139-144.
29. Coupland CAC, Hill T, Dening T, Morriss R, Moore M, Hippisley-Cox J. Anticholinergic drug exposure and the risk of dementia: a nested case-control study. JAMA Intern Med. 2019;179:1084-1093.
30. Fox C, Richardson K, Maidment ID, Savva GM, Matthews FE, Smithard D, Coulton S, Katona C, Boustani MA, Brayne C. Anticholinergic medication use and cognitive impairment in the older population: the medical research council cognitive function and ageing study. J Am Geriatr Soc. 2011;59:1477-1483.
31. Cai X, Campbell N, Khan B, Callahan C, Boustani M. Long-term anticholinergic use and the aging brain. Alzheimers Dement. 2013;9:377-385.
32. Zia A, Kamaruzzaman S, Myint PK, Tan MP. Anticholinergic burden is associated with recurrent and injurious falls in older individuals. Maturitas. 2016;84:32-37.
33. Phutietsile GO, Fotaki N, Jamieson HA, Nishtala PS. The association between anticholinergic burden and mobility: a systematic review and meta-analyses. BMC Geriatr. 2023;23:161.
34. Clarke CL, Sniehotta FF, Vadiveloo T, Donnan PT, Witham MD. Association between objectively measured physical activity and opioid, hypnotic, or anticholinergic medication use in older people: data from the physical activity cohort Scotland study. Drugs Aging. 2018;35:835-842.
35. Bag Soytas R, Arman P, Suzan V, Emiroglu Gedik T, Unal D, Suna Erdincler D, Doventas A, Yavuzer H. Association between anticholinergic drug burden with sarcopenia, anthropometric measurements, and comprehensive geriatric assessment parameters in older adults. Arch Gerontol Geriatr. 2022;99:104618.
36. Buckinx F, Rolland Y, Reginster JY, Ricour C, Petermans J, Bruyere O. Burden of frailty in the elderly population: perspectives for a public health challenge. Arch Public Health. 2015;73:19.
37. Chew J, Chia JQ, Kyaw KK, Fu KJ, Lim C, Chua S, Tan HN. Frailty screening and detection of geriatric syndromes in acute inpatient care: impact on hospital length of stay and 30-day readmissions. Ann Geriatr Med Res. 2023;27:315-323.
38. Chou YY, Lee YS, Lin CS, Chen JP, Kuo FH, Lin CF, Chen YM, Lin SY. Gender-specific linkages: frailty, polypharmacy, anti-cholinergic burden, and 5-year mortality risk-a real-world analysis. PeerJ. 2023;11:16262.