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ANTICHOLINERGIC BURDEN OF DRUGS PRESCRIBED TO GERIATRIC PATIENTS ATTENDING MEDICINE OUTPATIENT DEPARTMENT

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ABSTRACT: Background: Anticholinergic effects of drugs, particularly those prescribed to geriatric patients, have garnered significant attention due to their potential to induce a range of adverse outcomes, including cognitive decline, urinary retention, and increased risk of falls. Anticholinergic medications function by blocking the action of acetylcholine, neurotransmitter crucial for numerous involuntary bodily functions, and their use is prevalent in treating conditions - depression, anxiety & respiratory disorders among older adults. The clinical implications of these medications are profound, as older individuals often possess heightened vulnerability to their side effects, exacerbated by polypharmacy, age-related physiological changes. Evidence increasingly suggests, long-term use of these may lead to increased anticholinergic burden, associated with severe cognitive impairment and potentially contributing to the development of dementia. **Objectives:** Assess the anticholinergic burden in geriatric patients attending the medicine OPD. **Methods:** An observational, cross-sectional study was conducted during the period of mid-September to mid-November 2024, after approval from IEC(H) of the institute. Prescriptions of all geriatric patients above 60 years assessed after taking consent from prescribing physicians in MOPD. Drugs having anticholinergic properties will be scored by Anticholinergic Cognitive Burden Scale. After collection of data, they were entered & analysed using MS Excel 19. **Results:** Clinically significant anticholinergic burden was observed in 43.125% population. The most frequently prescribed drug was found to be Domperidone followed by Metformin and Nortriptyline. Among the comorbidities diabetes was commonly seen in majority the population. **Conclusion:** Co-professional care at MOPD with assessment of anticholinergic burden of geriatric prescriptions and advices on rational de-prescribing with suggestions on safer alternatives would be beneficial for treating physicians to optimize therapy.

INTRODUCTION: India is experiencing a significant demographic shift, with its elderly population projected to double by 2050. The current elderly population of 153 million (aged 60 and above) is expected to reach a staggering 347 million by 2050 ¹.

As India undergoes a significant demographic transformation, one of the most pressing issues emerging is the care and support for the growing elderly population ². This shift in demographics brings both opportunities and challenges, particularly in the field of elder care ².

One of the challenges with healthcare is the associated increase in anticholinergic exposure to older adults. In addition, several studies suggest an association between anticholinergic burden and declining physical function in older adults ³. Anticholinergic drugs bind to the muscarinic receptors and block acetylcholine neurotransmission, which is involved in many

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major body functions including central nervous system (CNS) functions such as attention, learning and memory mechanisms and peripheral nervous system (PNS) actions which are related to basal functioning of the organism such as urination, intestinal transit or heart rhythm regulation⁴. Anticholinergic burden in older adults has been associated with cognitive impairment, delirium, dizziness and confusion, falls and increased hospitalizations⁵.

Additionally, recent research highlights a gap in robust clinical guidelines and the need for further studies to delineate the relationship between anticholinergic medications and long-term cognitive outcomes in geriatric populations. This has prompted calls for careful assessment and management strategies that prioritize deprescribing or modifying anticholinergic regimens, particularly in patients showing signs of cognitive decline or diminished functional status. Although similar studies have been conducted elsewhere in India, there are minimal data regarding the same in North-Eastern states especially Assam. We hope such kind of study will bring about awareness to the prescribers and potentially deprescribe whenever necessary.

AIM & OBJECTIVE: To assess the presence of drugs having anticholinergic properties and distribution of ACB (Anticholinergic Burden) scores in geriatric patients attending the medicine OPD.

METHODOLOGY:

Nature of Study: It is an hospital-based observational, cross-sectional study.

Inclusion Criteria:

- Geriatric patients aged ≥ 60 years attending the Medicine OPD for any ailments
- New visits on the day of data collection
- Patients who are willing to participate in the study

Exclusion Criteria:

- Patients below 60 years of age,
- Incomplete prescriptions,

- Patients unwilling to participate in the study.

Study Setting: Data was collected from Medicine OPD of Assam Medical College and Hospital, Dibrugarh, State- Assam. Data management & analysis in Pharmacology Department.

Study Period: 2 months i.e. from 05/10/2024 to 05/12/2024.

Sample size: Sample size was calculated using the formula

$$n = Z^2pq / d^2$$

Here, $p = 31\%$ (reference 6) (The estimated population proportion)

$$q = 1-p$$

$d = 7.5\%$ (absolute error) (The desired margin of error)

$Z = 1.96$ for 95% confidence interval (z-score corresponding to the desired confidence level).

Putting these values in the above formula, yielded a sample size of 147. Considering 10% non-response, sample size was calculated and rounded off to 165.

Sampling Technique: Convenience sampling. Prescriptions meeting the specified inclusion criteria were selected and subjected to further analysis.

Methodology: After taking consent from the patients, prescriptions were assessed for those who would meet the inclusion criteria. Drugs having anticholinergic properties would be scored by Anticholinergic Cognitive Burden (ACB) Scale to measure the burden.

Clinically relevant burden was assessed using cumulative ACB per prescription/ patient i.e. sum score of ACB per prescription/patient.

Ethical Clearance: Ethical clearance obtained from the Institutional Ethics Committee (H) of Assam medical college and hospital, Dibrugarh prior to commencement of study. (AMC/EC/2024/5370). Date of approval 04/10/2024.

Low Potency (Score 1)			Medium Potency (Score 2)		High Potency (Score 3)	
Aclidinum ^(inh)	Cyclosporine	<i>Iloperidone</i>	Amantadine	<i>Acapromazine</i>	<i>Hyoscyamine</i>	<i>Acepromazine</i>
Alimemazine *	Desloratadine	Ipratropium ^(inh)	Baclofen	Amitriptyline	Imipramine	Azatadine
Alprazolam	Desvenlafaxine	Isosorbide mononitrate	Carbamazepine	<i>Amoxapine</i>	Levomepromazine *	Clocapramine
<i>Alverine</i>	Dexamethasone	Isosorbide dinitrate	Cloperastine	Atropine	Meclozine *	Cycrimine
Amisulpride	Dextromethorphan	Ketorolac	<i>Cimetidine</i>	<i>Belladonna</i>	<i>Mequitazine</i>	Darbrompheniramine
Ampicillin	Diazepam	Ketotifen	Cyclobenzaprine	<i>Benzatropine</i> *	Nortriptyline	Dextropropoxyphene
Aripiprazole	<i>Digitoxin</i>	Levocetirizine	<i>Dosulepin</i>	Biperiden	<i>Opipramol</i>	Dicyclomine *
Asenapine	Digoxin	Levodopa-carbidopa	<i>Fluphenazine</i>	Brompheniramine	<i>Orphenadrine</i>	Doxylamine
Atenolol	Diltiazem	Lithium	Loxapine	<i>Carbinoxamine</i>	Otilonium bromide	<i>Emetprontium</i>
Azathioprine	Dipyridamole	Loperamide	Maprotiline	<i>Carisoprodol</i>	Oxybutynin	<i>Fenoterodine</i>
Benazepril	Disopyramide	Loratadine	Meperidine *	Chlorphenamine *	<i>Pheniramine</i>	<i>Fluphenazine</i>
Betaxolol	Domperidone	Lorazepam	Methodone	<i>Chlorpromazine</i>	<i>Procymidine</i>	Hydroxyzine
Bisacodyl	Entacapone	<i>Lamotrigine</i>	<i>Melindone</i>	<i>Chlorprothixene</i>	Promethazine	
Bromocriptine	Escitalopram	Mebeverine	<i>Nefopam</i>	<i>Cimetropium bromide</i>	<i>Propantheline</i>	
<i>Bromperidol</i>	<i>Estazolam</i>	Metformin	Olanzapine	Clemastine	Propiverine	
Bupropion	Famotidine	Methocarbamol	Oxcarbazepine	Clomipramine	<i>Protriptyline</i>	
Captopril	Fentanyl	Methotrexate	Paroxetine	Clzapine	Pyrilamine *	
<i>Cefamandole</i>	<i>Fexofenadine</i>	Methylprednisolone	Perphenazine	Cyproheptadine	Scopolamine *	
Cefoxitin	<i>Flunitrazepam</i>	Metoclopramide	Pimozide	<i>Darifenacin</i>	Solifenacin	
Celecoxib	Flupentixol	Metoprolol	<i>Prochlorperazine</i>	<i>Desipramine</i>	<i>Thioridazine</i>	
<i>Cephalothin</i>	Fluoxetine	Midazolam	<i>Promazine</i>	Dexbrompheniramine	<i>Timonium iodide</i>	
Cetirizine	Fluvazepam	Mirtazapine	<i>Propoxyphene</i>	Dexchlorpheniramine	<i>Tinepidium bromide</i>	
Cinnarizine	Fluvoxamine	Morphine	Quetiapine	Dicyclomine *	Tizanidine	
Chlordiazepoxide	Furosemide	Naratriptan	Ranitidine	<i>Difemerine</i>	Tolerodine	
Chlortalidone	Gentamicin	<i>Nefazodone</i>	Tramadol	Diphenhydramine *	<i>Trifluoperazine</i>	
Citalopram	Glycopyrronium ^(inh)	<i>Nifedipine</i>	Tripolidine	Doxepin	<i>Trihexyphenidyl</i>	
Clindamycin	Guafenesin	<i>Nizatidine</i>	Zuckoperthixol	Doxylamine	Trimipramine	
Clonazepam	Haloperidol	<i>Oxazepam</i>		<i>Emoproxinum</i>	Tropatepine	
Clorazepate	Hydralazine	<i>Pantoprazole</i>		Fexofenadine	Trospium	
Codine	<i>Hydrocodone</i>	<i>Pheniramine</i>		Flavoxate	<i>Valethamate</i>	
<i>Cortisone</i>	Hydrocortisone			<i>Hematropine</i>		
Cycloserine	Hydromorphone			Hydroxyzine		

Drugs in italics are not currently commercialized/authorized in Spain as of November 2021. * Alimemazine / Trimeprazine * Benztropine * Dicyclomine / dicycloverine / methscopolamine / methixene / propantheline * Promethazine * chlorphenamine / chlorpheniramine * Levomepromazine / methotrimeprazine * Meclozine / meclizine * Mequitazine * Opipramol * Pyrilamine / mepyramine * Scopolamine / Hyoscine. Inh, inhalative.

FIG. 1: ANTICHOLINERGIC COGNITIVE BURDEN (ACB) SCALE CLASSIFICATION OF DRUGS ACCORDING TO LOW, MEDIUM, AND HIGH POTENCY

RESULTS & OBSERVATION:

TABLE 1: AGE DISTRIBUTION OF GERIATRIC PATIENTS

Age	Frequency	Percentage
60-69	95	59.375%
70-79	53	33.125%
≥80	12	7.5%
Total	160	100%

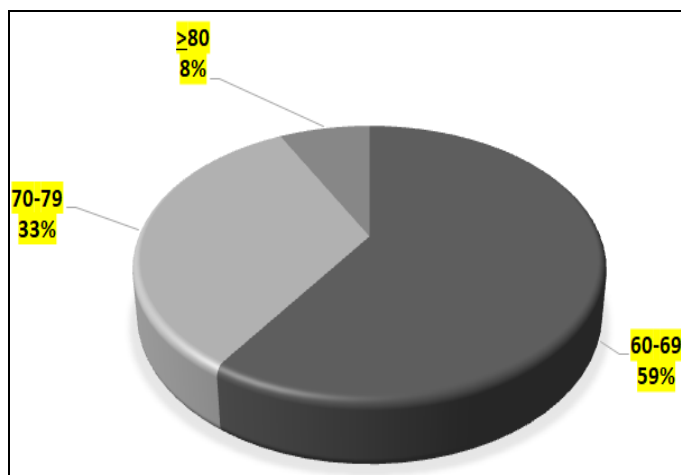


FIG. 2: AGE DISTRIBUTION OF GERIATRIC PATIENTS INCLUDED IN THE STUDY

TABLE 2: SEX DISTRIBUTION OF GERIATRIC PATIENTS

Sex	Frequency	Percentage
Male	86	53.75%
Female	74	46.25%
Others	0	0
Total	160	100%

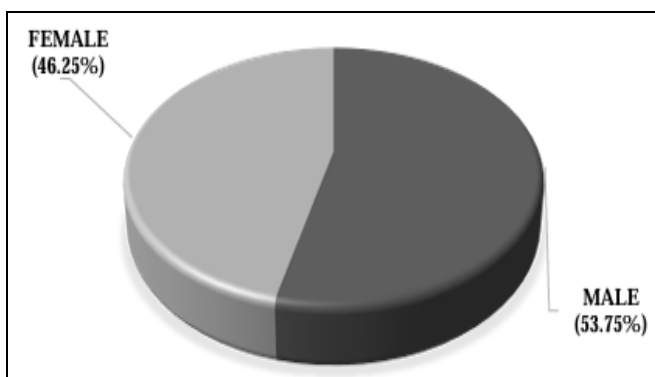


FIG. 3: SEX DISTRIBUTION OF GERIATRIC PATIENTS INCLUDED IN THE STUDY

TABLE 3: PRESCRIPTIONS CONTAINING AT LEAST ONE DRUG WITH ANTICHOLINERGIC PROPERTIES

Total Prescription/ Patient	Prescription- contained at least 1 drug having anticholinergic properties	Percentage
160	69	43.125%

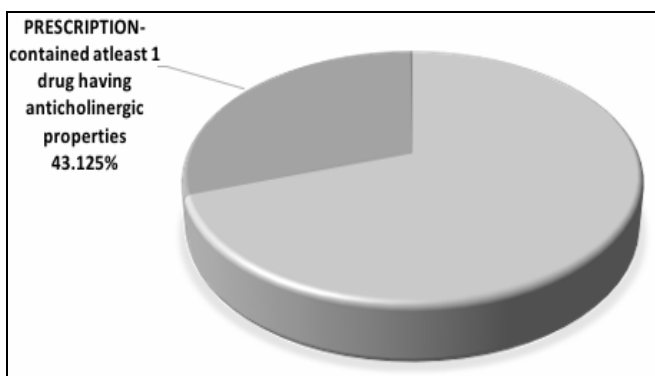


FIG. 4: PROPORTION OF PRESCRIPTIONS CONTAINING AT LEAST ONE DRUG WITH ANTICHOLINERGIC PROPERTIES

TABLE 4: ANTICHOLINERGIC COGNITIVE BURDEN (ACB) SCORE PER PRESCRIPTION/PATIENT

ACB	Frequency	Percentage
ACB score 1	49	71.01%
ACB score 2	3	4.35%
ACB score 3	17	24.64%
Total	69	100%

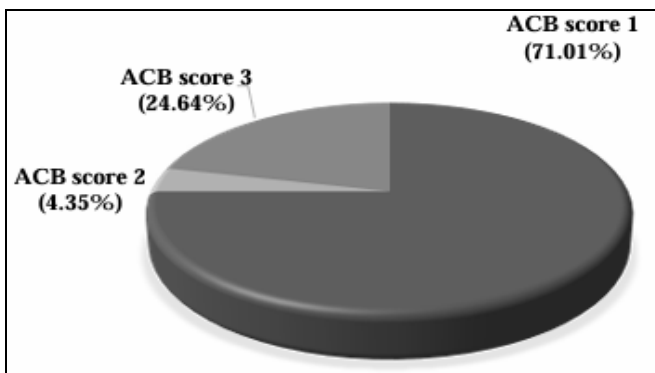


FIG. 5: DISTRIBUTION OF ANTICHOLINERGIC COGNITIVE BURDEN (ACB) SCORES AMONG PATIENTS WITH ANTICHOLINERGIC EXPOSURE

TABLE 5: AGE DISTRIBUTION OF PATIENTS HAVING AT LEAST ONE ANTICHOLINERGIC EXPOSURE

Age	Frequency	Percentage
60-69	15	21.74%
70-79	23	33.33%
≥80	31	44.93%
Total	69	100%

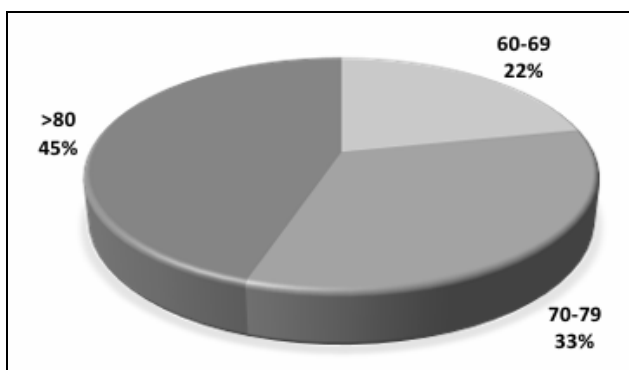


FIG. 6: AGE DISTRIBUTION OF PATIENTS HAVING AT LEAST ONE ANTICHOLINERGIC EXPOSURE

TABLE 6: COMORBIDITIES AMONG PRESCRIPTIONS CONTAINING ACB DRUGS

Co-Morbidities	Frequency (N)	Percentage (%)
Diabetes	19	27.54%
Neuropathy	14	20.29%
Edema	12	17.39%
Allergic Rhinitis	10	14.5%
Asthma	4	5.79%
Urticaria	2	2.90%
Hypertension	2	2.90%
Others	6	8.69%
Total	69	100%

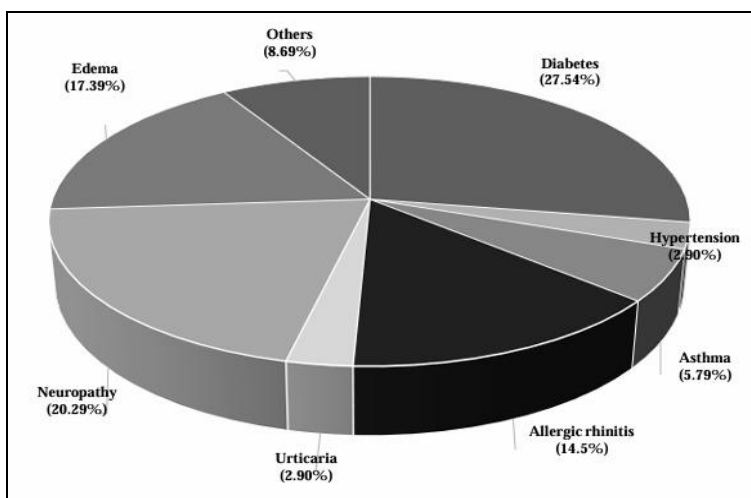


FIG. 7: DISTRIBUTION OF COMORBIDITIES AMONG PRESCRIPTIONS CONTAINING ACB DRUGS

TABLE 7: DRUG UTILIZATION PATTERN OF DRUGS WITH ANTICHOLINERGIC BURDEN

Drug (with ACB)	Indication	Total	Male	Female
Domperidone	GERD	27 (39.13%)	14	13
Metformin	T2DM	19 (27.54%)	11	8
Nortriptyline	Neuropathy	14 (20.29%)	9	5
Furosemide	Edema	12 (17.39%)	8	4
Levocetirizine	Allergic Rhinitis	9 (13.04%)	4	5
Hydrocortisone	Urticaria	6 (8.69%)	3	3
Ipratropium (Inh)	Asthma	4 (5.79%)	3	1
Tramadol	Pain	3(4.35%)	0	3
Chlorthalidone	Hypertension	2 (2.89%)	0	2
Clonazepam	Insomnia	2 (2.89%)	1	1
Diazepam	Seizure Disorder	2 (2.89%)	2	0
Lorazepam	Insomnia, Anxiety	2 (2.89%)	0	2
Dicyclomine	Pain Abdomen	2 (2.89%)	0	2
Fexofenadine	Allergic Rhinitis	1 (1.45%)	1	0
Hyoscyamine	Pain Abdomen	1 (1.45%)	0	1

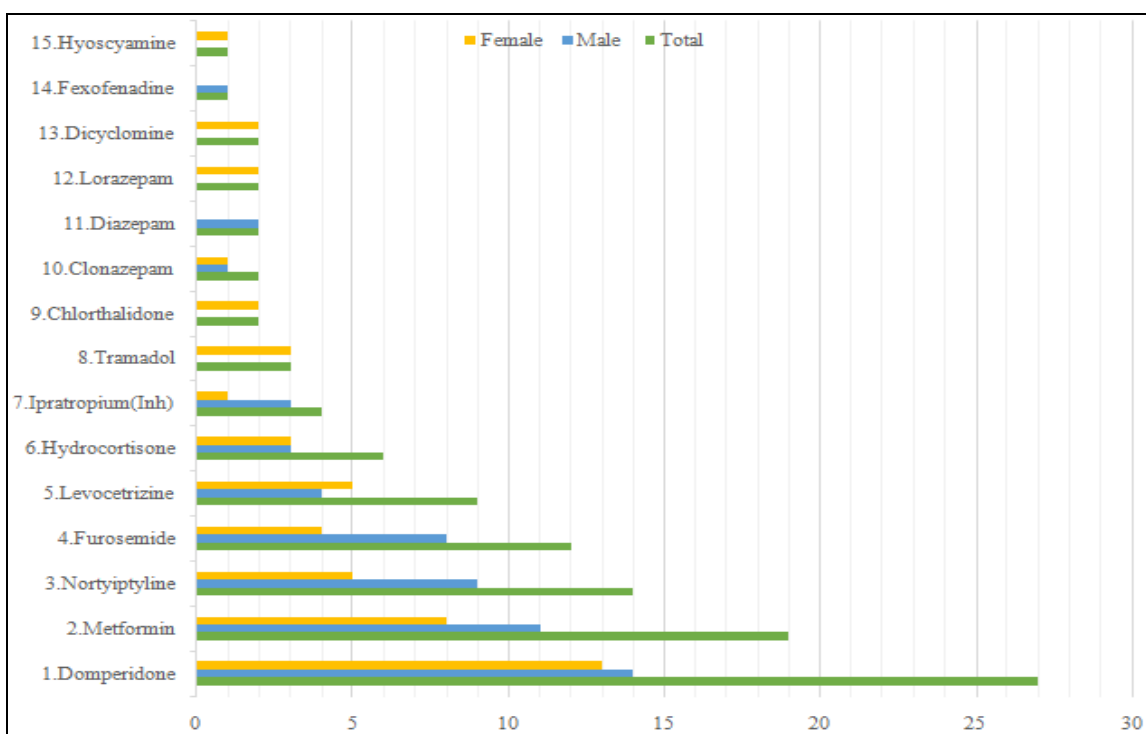


FIG. 8: DRUG UTILIZATION PATTERN OF MEDICATIONS WITH ANTICHOLINERGIC BURDEN

DISCUSSION: In the present study, out of 160 prescriptions analysed, 43.125% of prescriptions contained at least one drug with anticholinergic properties. Similar findings have been reported in previous studies, where approximately one-third of the study population exhibited significant anticholinergic exposure^{8,9}.

Among those 69 prescriptions, some prescriptions contained more than one drugs having anticholinergic properties; in such cases, the cumulative ACB score was calculated by summing the individual drug scores. Assessment of anticholinergic cognitive burden (ACB) scores revealed that among patients with anticholinergic exposure (n=69), the majority (71.01%) had an ACB score of 1, while 4.35% and 24.64% had ACB scores of 2 and 3 respectively. An ACB score of 3 or more represents clinically significant anticholinergic burden and requires careful risk-benefit evaluation by the treating physician. Clinically significant anticholinergic burden was observed in 24.64% population (ACB score 3 or more), which is fairly high. Similar findings were reported in earlier studies where ACB score of 3 or more was found in 22.58% of the patients⁵. Age-wise analysis of patients exposed to anticholinergic drugs showed that the highest exposure was among patients aged above 80 years (44.93%). This

observation aligns with findings from previous studies, which reported increasing anticholinergic burden with advancing age, largely due to multiple comorbidities and polypharmacy¹⁰.

Regarding comorbidities, diabetes mellitus (27.54%) was the most common condition among patients receiving anticholinergic drugs, followed by neuropathy (20.29%) and edema (17.39%). Similar patterns have been reported in other Indian studies, where metabolic (hypertension and diabetes) and neurological disorders were commonly associated with anticholinergic medication use⁵. The frequent presence of multiple comorbidities further contributes to polypharmacy and elevated anticholinergic burden. In the present study, domperidone was the most commonly prescribed drug with anticholinergic properties, followed by metformin and nortriptyline. Similar drug utilization patterns have been reported in earlier studies, in which alprazolam was the most frequently prescribed medication, followed by amitriptyline and theophylline⁵; however, these findings differ from those observed in our study setting; contributed significantly to the overall anticholinergic burden. The frequent use of such medications highlights the need for cautious prescribing in elderly patients. Overall, the findings of the present study are consistent with previously

published literature, emphasizing that anticholinergic drug exposure remains common among geriatric patients. Regular medication review, use of anticholinergic burden assessment tools, and increased awareness among healthcare professionals are essential to minimize potential drug-related problems in this vulnerable population.

CONCLUSION: The present study highlights a substantial prevalence of drug (having anticholinergic properties) use among geriatric patients. Nearly half of the analysed prescriptions contained at least one medication with anticholinergic properties, indicating a significant anticholinergic burden in the elderly population. Most patients were exposed to drugs with lower ACB scores; however, a considerable proportion received medications with high anticholinergic burden, which may predispose them to adverse outcomes such as cognitive impairment, falls, and reduced quality of life. Advanced age, presence of multiple comorbidities, and polypharmacy were identified as important contributing factors. Geriatric population warrants special care in prescribing. Awareness of prescribers is required regarding the distribution of Anticholinergic burden in geriatric population, associated risk factors, and effective measures to assess and intervene if necessary. Co-professional care at MOPD with assessment of anticholinergic burden of geriatric prescriptions and advices on rational prescribing, periodic medication review and de-prescribing of unnecessary anticholinergic medications with suggestions on safer alternatives should be encouraged, particularly in patients above 80 years. There is a clear role of pharmacologists in imparting better patient care in geriatric patients by providing options to the physicians/patients on using safer alternatives (drugs with less ACB) wherever possible. We believe this would go a long way on reducing the ACB burden on the patients and improve geriatric care significantly.

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