ORIGINAL RESEARCH

Factors Associated With Medication Adherence In Elderly Retired Outpatients In São Paulo, Brazil

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Objective: To evaluate medication adherence and associated socioeconomic factors in elderly Brazilians.

Methodology: This observational study was conducted with 159 elderly retired in an outpatient clinic in the city of São Paulo. Treatment adherence was assessed with the questions from the Morisky Green Levine Medication Adherence Questionnaire, and medications were classified using the Anatomical Therapeutic Chemical system. Statistical tests and adjusted Poisson regression models were used to analyze variables.

Results: The study population was mostly female (67.5%), had an average age of, and took an average of 6.5 medications per day. The most commonly used drugs were agents acting on the renin-angiotensin system (67.9%), statins (62.3%), antithrombotic agents (48.4%), and biguanides (37.1%) for the treatment of hypertension (76.7%), dyslipidemia (54.1%), and diabetes (47.8%). The rate of adherence was below 60% in the groups of participants that were analyzed except for the high household income category, which had a rate of 75.8%.

Conclusion: Medication adherence among the elderly was low in all categories except for the high household income category, a relevant finding that will help to understand medication adherence patterns in elderly Brazilians.

Keywords: medication adherence, aged, geriatrics, polypharmacy, drug therapy, socioeconomic factors

Introduction

Transformative advances in healthcare, especially in pharmacology, have contributed to significantly increased life expectancy worldwide. However, the people for whom these medications are designed do not always consume them in accordance with clinical indications. The elderly make up a population of particular interest in medication adherence research as—in addition to consuming the highest proportion of medication per capita—they are beginning to occupy a more substantial proportion of the total population. Additionally, older adults with chronic conditions are at a higher risk of suffering damaging health consequences caused by lack of compliance with drug indications.[1,2] Issues with adherence mainly occur among elderly people who use five or more drugs per day, a situation known as polypharmacy. Recent publications demonstrate that most older adults are unable to take multiple simultaneous prescriptions adequately.[3,4]

Elderly people (above the age of 60) currently make up approximately 14% of the Brazilian population, and this proportion is projected to increase to almost 30%

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by 2050.[5] In addition to an increase in this population, medication use in this country is expected to increase, meaning that medication adherence is, therefore, a significant research topic for Brazil. The nation's socialized public healthcare system provides an additional incentive to better understand the factors that impede senior citizens with chronic disease from taking their medications as indicated, as lack of adherence can increase healthcare costs.[1,6,7] This document will use the World Health Organization's definition of adherence, which is: "the extent to which a person's behavior—taking medication, following a diet, and/or executing lifestyle changes—corresponds with agreed recommendations from a health care provider."[8]

An observational study by Uchmanowicz[9] using this scale found higher rates of adherence in participants with higher educational achievement and family support, indicating a possible relationship between socioeconomic factors and medication, albeit one that is not widely studied.[10] Previous studies on medication adherence in elderly people in developing countries, especially in the context of polypharmacy, have previously incorporated socioeconomic variables. However, very few studies explicitly state that this is the primary motive for the study. Another issue is the lack of ability to compare adherence findings between different countries and regions. Specific instruments—such as the Anatomical Therapeutic Chemistry (ATC)[11] classification and the Morisky Green Levine Medication Adherence Questionnaire (MGLQ)[12]—have been validated to measure medication use and adherence, respectively. The MGLQ is one of the most widely used questionnaires in Brazilian research on medication adherence[13,14] and was selected for this study for this reason and also because it provides standardized results to compare adherence across cultures and countries. Most studies on adherence in Brazil are not published in English, and the MGLQ will allow for our results to reach a wider international audience.

Brazil has numerous medical, social, and economic reasons for requiring a study on medication adherence in the elderly. The nation is a middle-income country with high levels of inequality—especially among older adults—that is going through a demographic transition. Brazil is also one of the countries with the highest rates of polypharmacy in the world, along with the United States, Sweden, India, the United Kingdom, and China.[15,16] Chronic diseases are an increasing concern in Brazil, and suboptimal medication adherence is thought to be impeding chronic disease control. The socialized public health system still lacks comprehensive public policy on medication distribution.[2] Accordingly, this study was designed to provide evidence on medication adherence and related socioeconomic factors among elderly retirees in an outpatient clinic in São Paulo. It was conducted in the city of São Paulo, as it is the largest and most populated city in the country and also has a large population of elderly residents.

Methods
Study Design, Setting, And Population
This cross-sectional study was carried out in elderly retiree outpatients of the cardiology and endocrinology departments at a public hospital in São Paulo. These two outpatient clinics were chosen because of their high volume of geriatric patients with chronic conditions and without cognitive decline or severe acute disease. The clinics provided enough patients for the sample size (159 patients) to be representative of the broader population of older retired adults in São Paulo. Data collection occurred between June 2016 and July 2017.

All elderly patients requesting medical attention at these clinics during the data collection period were approached and asked if they wished to participate in the study. If the patient expressed interest, the study design and purpose was explained in plain language, and the patient signed an informed consent form to agree to their official participation in the research study. Inclusion criteria included being a retired adult between the age of 60 and 75 and taking at least two medications per day. Retirement was defined as receiving a monthly pension from the government; in Brazil, men can receive a government pension once they turn 65 and women, once they turn 60, or any individual can receive a pension for working a stipulated number of years or for work-related injuries/disabilities. The age limit to define the elderly was set per World Health Organization guidelines, which define elderly people as individuals over the age of 60 in lesser-developed regions.[6] An estimated 77% of Brazilians with dementia have not been diagnosed,[17,18] and therefore, all patients over the age of 75 were excluded. This was to avoid ethical issues and to avoid introducing recall bias into the study. The only other exclusion criterion was insufficient mental capacity to respond to questionnaire items. To ensure the complete absence of memory issues, research personnel also administered the Mini-Mental State Examination (MMSE),[19] an easy-to-administer and

widely-used instrument. The MMSE is a screening test for possible cognitive decline, in which a score of 24 or lower suggests cognitive decline.[19] In this study, two potential participants had a score below 25 and were therefore excluded.

Questionnaire: General Information

This study used the MGLQ and ATC instruments: both questionnaires had been previously translated into Portuguese and validated. A pharmacy student and two nurses administered the questionnaires in face-to-face interviews in Portuguese in approximately 40 min sessions on the day of the respective patient's appointment. All patient-reported information was corroborated with patient files to avoid bias.

Socioeconomic variables were divided into categories: marital status was divided into married or other (unmarried, divorced, or widowed); educational level was divided into low level of schooling (illiterate or incomplete elementary school), some schooling (complete elementary school or incomplete secondary school), and complete basic education (complete secondary education or above); housing was divided into other (inherited house, renting, or living with children) and home-owner; reason for retirement was divided into retirement by age, time of service, or disability; retirement times were dichotomized as fewer than 10 years or over 10 years. Household income was divided into low income (below two minimum monthly salaries) and high income (above two minimum monthly salaries). As a reference, the minimum monthly salary in 2017 was BRL 937, or approximately USD 250. Brazilians are generally uncomfortable reporting their annual income to strangers and this was a division that most participants were familiar with and comfortable with reporting.

Morisky, Green And Levine Medication Adherence Questionnaire

Adherence to drug treatment was assessed using the questions contained in the MGLQ, a test developed in the United States and validated for the Portuguese language. The test is easy to understand and consists of four yes-or-no questions that identify attitudes towards drug therapy and behaviors involved in taking medication. Each "yes" receives a score of zero (0), and each "no" receives a score of one (1). If all the answers are "no," the score is 4, and if all the answers are "yes," it is 0. In our research, participants with a score between 0 and 2 points were classified

as "not adherent" and participants with a score of 3 or 4 points were classified as "adherent."

Anatomical Therapeutic Chemical Classification System

We used the ATC to analyze the medications our study participants used. With the ATC methodology, drugs are divided into groups at their respective sub-levels based on their mechanisms of action, chemical properties, therapeutic actions, and kinetic and dynamics classifications. The ATC's standardization allows for comparable statistical studies, which then allows for improved comparisons and measurements in drug development and utilization.[13]

Sample Size

The sample size was calculated with the 6th edition of the EpiInfo program using statistics on the number of retirees in São Paulo (53.7%), older adults with dementia (13%), and individuals in polypharmacy regimens. These percentages were used to calculate the proportion of retirees both in treatment and in follow-up, subtracting the estimated number of retirees with dementia. The formula was applied to the final value and multiplied by 1.18, estimating a refusal rate of 10% and an incompletion rate of 5%. A total of 167 elderly outpatients were approached, of which eight patients were excluded for not fulfilling inclusion/exclusion criteria or for filling out the questionnaires incorrectly. Therefore, the final sample size was 159 participants.

Statistical Analysis

The data were first described with descriptive statistics, including mean and standard deviation, absolute numbers, and relative percentages for quantitative variables. A Shapiro-Wilk test and Levene test were run to verify assumptions of normal distribution and homogeneity of variances, both for age (W = 0.961; p < 0.001/F (49) = 0.901; p = 0.645) and for the number of medications used (W = 0.959; P = 0.0001/F (49) = 1.047; P = 0.873). A Mann–Whitney test was used to compare ages and numbers of medications. Pearson Chi-square tests were used to compare marital status, education levels, household income, housing, retirement time, and retirement type between the sexes. The association between the variables and adherence to medication use on the MGLQ was tested using Poisson regression models adjusted with robust variance. All analyses were performed in the version 3.4.2 of R using the prevalence and sandwich

packages. The level of significance adopted for all analyses was p <0.05.

Ethics

The Research Ethics Committee of IAMSPE approved the study, with reference number 1.598.277. All participants received a clear, plain-language summary of the study design, benefits, and risks and then signed voluntary informed consent forms. As this study was purely observational and questionnaire-based, the risk to participants was considered low.

Results

A total of 167 elderly outpatients were approached, of which two patients refused participation and eight patients did not fulfill inclusion/exclusion criteria or fill out the questionnaires correctly. Therefore, the total final sample size was 159 participants. The sample was predominantly female (68.5%), highly educated (50.3%), had above-average income (60.5%), and were home-owners (95%). The average age of the participants was 68.30 ± 4.0 years, 80% were retired after meeting the minimum number of years worked, and 67% had been retired for over ten years (Table 1).

The most common chronic diseases were: systemic arterial hypertension (76.7%), dyslipidemias (54.1%), diabetes/hyperglycemia (47.8%), and gastro-esophageal reflux disease (GERD, 38%), as shown in Table 2. Table 3 presents the medicines that the elderly used, divided into generic denominations of the ATC classification. The most commonly used agents were those that act on the renin-angiotensin system (67.9%), inhibitors of the enzyme 3-hydroxy-3-methyl-glutaryl-CoA reductase—also known as statins—(62.3%), antithrombotic agents (48.4%), medicines for the treatment of peptic ulcers (36.5%), and biguanides (37.1%). Many of the participants were on polypharmacy regimens, taking an average of 6.5 medications per day.

The results of adherence measured with the MGLQ and analyzed with Poisson regression analysis are presented in Table 4. The medication adherence rate was below 60% in all of the socioeconomic categories that were analyzed,

Table 1 General Characteristics Of The Sample By Patient Gender

Variables	Female (n = 109)	Male (n = 50)	Total (n = 159)	P Value
Age (years)	68.3 ± 4.0	684 ± 4.2	68.3 ± 4.0	0.859
Medications used per day	6.5 ± 2.7	6.4 ± 2.7	6.5 ± 2.7	0.952
Variables	**N (%)**	**N (%)**	**N (%)**	**P Value**
Marital status				<0.001
Married	58 (53.2)	44 (88.0)	102 (64.2)	
Others	51 (46.8)	6 (12.0)	57 (35.8)	
Educational level				0.855
Low	33 (30.3)	13 (26)	46 (28.9)	
Medium	22 (20.2)	11 (22)	33 (20.8)	
High	54 (49.5)	26 (52)	80 (50.3)	
Household income				0.315
Below two minimum salaries	47 (42.6)	17 (32.7)	64 (39.5)	
Above two minimum salaries	62 (57.4)	33 (67.3)	95 (60.5)	
Type of residence				0.442
Owner-occupied	105 (96.3)	46 (92.0)	151 (95.0)	
Others	4 (3.7)	4 (8.0)	8 (5.0)	
Retirement time				0.341
Less than ten years	67 (61.5)	26 (52.0)	93 (58.5)	
More than ten years	42 (38.5)	24 (48.0)	66 (41.5)	
Type of retirement				0.293
Age	18 (16.5)	4 (8.0)	22 (13.8)	
Number of years worked	80 (73.4)	42 (84.0)	122 (76.7)	
Disability/other	11 (10.1)	4 (8.0)	15 (9.4)	

Table 2 Frequency Distribution Of Morbidities By Patient Gender

Morbidity	Female (n = 109) n (%)	Male (n = 50) n (%)	Total (n = 159) n (%)
Systemic arterial hypertension	82 (75.2)	40 (80.0)	122 (76.7)
Dyslipidemia	62 (56.9)	24 (48.0)	86 (54.1)
Diabetes mellitus	48 (44.0)	28 (56.0)	76 (47.8)
GERD	16 (14.7)	6 (12.0)	22 (38.0)
Hypothyroidism	36 (33.0)	8 (16.0)	44 (27.7)
Arthrosis	27 (24.8)	12 (24.0)	39 (24.5)
Arrhythmia	6 (5.5)	10 (20.0)	16 (10.1)
Depression	13 (11.9)	3 (6.0)	16 (10.1)
Coronary insufficiency	11 (10.1)	5 (10.0)	16 (10.1)
Osteopenia	14 (12.8)	1 (2.0)	13 (8.2)
Arthritis	9 (8.3)	2 (4.0)	11 (6.9)
Hepatic steatosis	8 (7.3)	1 (2.0)	9 (5.7)
Gastritis	9 (8.3)	0 (0)	9 (5.7)
Glaucoma	7 (6.4)	2 (4.0)	9 (5.7)
Asthma	6 (5.5)	2 (4.0)	8 (5.0)
Coronary arterial disease	6 (5.5)	2 (4.0)	8 (5.0)
Osteoporosis	7 (6.4)	1 (2.0)	8 (5.0)
Cataracts	5 (4.6)	2 (4.0)	7 (4.4)
Chronic atrial fibrillation	6 (5.5)	1 (2.0)	7 (4.4)
Chronic renal insufficiency	4 (3.7)	3 (6.0)	7 (4.4)
Prostatic hyperplasia	1 (0.9)	5 (10.0)	6 (3.8)
Hyperthyroidism	3 (2.8)	1 (2.0)	4 (2.5)
Lower back pain	3 (2.8)	1 (2.0)	4 (2.5)
Varicose veins	4 (3.7)	0 (0)	4 (2.5)
Cardiac valvulopathy	2 (1.8)	2 (4.0)	4 (2.5)
Cerebral vascular accident	3 (2.8)	0 (0)	3 (1.9)
COPD	2 (1.8)	1 (2.0)	3 (1.9)
Labyrinthitis	3 (2.8)	0 (0)	3 (1.9)
Alzheimer's disease	1 (0.9)	1 (2.0)	2 (1.3)
Ischemic stroke	1 (0.9)	1 (2.0)	2 (1.3)
Gout	1 (0.9)	1 (2.0)	2 (1.3)
Inguinal hernia	1 (0.9)	1 (2.0)	2 (1.3)
Hypoparathyroidism	2 (1.8)	0 (0)	2 (1.3)
Gall stones	1 (0.9)	0 (0)	1 (0.6)
Bipolar Disorder	1 (0.9)	0 (0)	1 (0.6)
Diverticulitis	1 (0.9)	0 (0)	1 (0.6)
Epilepsy	0 (0)	1 (2.0)	1 (0.6)
Congestive cardiac insufficiency	1 (0.9)	0 (0)	1 (0.6)
Gastric reflux	1 (0.9)	0 (0)	1 (0.6)

Abbreviations: GERD, gastroesophageal reflux disease; COPD, chronic obstructive pulmonary disease.

with no statistically significant difference between groups except in the high-household-income cohort, where the prevalence of adherence was 75.8%.

Discussion

This study evaluated the level of medication adherence among retired elderly participants and related socioeconomic factors in a public outpatient clinic in the city of São Paulo.

The study population mostly consisted of women with high levels of education who were homeowners with a household income considered high for elderly Brazilians. The mean age of the participants was 68, and most had retired after having worked the required number of years. As this research was carried out in a large urban center, it contrasts with other studies in rural areas, where elderly residents live in more varied socioeconomic conditions.

Table 3 Distribution Of Frequencies Of Medications Used Under Generic Names – Anatomical Therapeutic Chemistry Classification

Anatomical Therapeutic Chemistry Classification	N	(%)
A02B – Medications for the treatment of peptic ulcers	58	36.5
A03 – Propulsive agents	10	6.3
A10A – Insulin and analogs	27	17
A10BA – Biguanides	59	37.1
A10BB – Sulfonylureas	40	25.2
A10BG – Thiazolidinediones	14	8.8
B01 – Antithrombotic agents	77	48.4
C01B – Antiarrhythmics	11	6.9
C01D – Vasodilators used in heart disease	17	10.7
C01E – Other cardiac preparations	2	1.3
C02A – Central acting alpha-adrenergic antagonist	2	1.3
C02C – Peripheral alpha-adrenergic antagonist	2	1.3
C02D – Direct vasodilators	7	4.4
C03A – Thiazide diuretics	45	28.3
C03C – Loop diuretics	16	10.1
C03D – Potassium-sparing diuretics	6	3.8
C07 – Beta-blocker agents	66	41.5
C08 – Calcium channel blockers	31	19.5
C09 – Agents acting on the renin-angiotensin system	107	67.3
C10AA – 3-hydroxy-3-methyl-glutaryl-CoA reductase inhibitors (statins)	99	62.3
C10AB – Fibrates	2	1.3
H02 – Corticosteroids for systemic use	2	1.3
H03A – Thyroid hormones	46	28.9
M01A – Non-steroidal anti-inflammatory and anti-rheumatic agents	7	4.4
M03BX – Other central-acting agents	3	1.9
N02 – Analgesics	4	2.5
N02A – Opioids	1	0.6
N02B – Other analgesics and antipyretics	18	11.3
N03AE – Benzodiazepines	1	0.6
N05A – Antipsychotics	4	2.5
N05BA – Benzodiazepines	1	0.6
N05C – Hypnotics and sedatives	1	0.6
N06A – Antidepressants	5	3.1
N06AB – Selective serotonin reuptake inhibitors	17	10.7
S01E – Antiglaucoma and miotic preparations	5	3.1

Previous publications in the literature have suggested a possible relationship between low adherence and socio-economic factors. One study carried out in 934 elderly residents of the Brazilian state of Goiás (predominantly widows and low-income earners) found a prevalence of adherence of 24% for those on polypharmacy regimens. Another Brazilian study, conducted in primarily low-income elderly people in the state of Rio Grande do Sul, found a prevalence of low adherence among a third of the 1,598 people interviewed. A third Brazilian study, in the state of Minas Gerais, found that adherence was 47% in 279 elderly participants, most of whom were low-income women on polypharmacy regimens.[7,20,21]

The most common chronic morbidities in treatment in our study participants were systemic arterial hypertension, dyslipidemia, diabetes mellitus/hyperglycemia, and gastro-esophageal reflux disease. This distribution of chronic conditions is in line with Stopa's[22] findings: a considerable increase in the incidence of these pathologies in São Paulo from 2003 to 2015 with low adherence to recommended behavioral changes. It is widely known that both behavioral changes (improvements in diet and lifestyle) and pharmacological treatments are necessary to prevent and control chronic disease. However, Brazilians tend to prefer pharmacological treatments, as they are easier to access, have a more evident therapeutic efficacy, and are simpler to take than making lifestyle changes. This difficulty in promoting lifestyle changes has been evidenced by low adherence to non-medication treatments as an auxiliary to pharmacological treatment.[20,21,23–30]

The most used medications in this study, organized by ATC classification, were agents acting on the renin-angiotensin system, statins, antithrombotic agents, and biguanides. These drugs are used to treat the most prevalent diseases among the elderly, such as hypertension, dyslipidemia, and diabetes/hyperglycemia, which are the very same diseases that are predominant in our population.[22,23,25–30] The ATC classification used in this study is an important contribution to the literature, as the study results are standardized internationally—a rarity in Brazilian publications. Using this classification, we found an average use of 6.5 medications per day, which meets the definition of polypharmacy, a situation also found in other Brazilian and international articles on the subject.[16,25]

In our study, the prevalence of adherence measured with the MGLQ questions was below 60% in all categories, except for those in the high household income category (75.8%). The literature considers adherence rates between 40 and 60% to be low.[8,12,31,32] Menditto et al.[5] carried out an exploratory study of 39,000 elderly patients in three European countries using medication registries to calculate non-adherence. The study authors found prevalences of non-adherence to the use of antihyperlipidemic drugs to be 36.87% in Ireland, 60.93% in Spain, and 68.44% in Italy, with general medication adherence rates of 50% in the three countries. Lee[25] conducted an observational study of 1,154 (predominantly elderly) hypertensive individuals in Hong Kong, finding low or

Table 4 Prevalence Of Medication Adherence According To Participant Characteristics

Variable	N	Prevalence (%)	P Value	PR (IC95%)
Sex				
Female	52	47.7 (38.4–57.1)		1
Male	23	46.0 (32.2–59.8)	0.842	0.96 (0.67–1.38)
Educational level				
Low	20	43.5 (29.2–57.8)		1
Medium	14	42.4 (25.6–59.3)	0.926	0.98 (0.58–1.63)
High	41	51.3 (40.3–62.2)	0.412	1.18 (0.80–1.75)
Residence				
Other	3	37.5 (3.4–71.0)		1
Owner-occupied	72	47.7 (39.7–55.6)	0.605	1.27 (0.51–3.16)
Household income				
Below two minimum salaries	26	41.9 (29.7–54.2)		1
Above 2 minimum salaries	72	75.8 (67.2–84.4)	0.249	1.23 (0.87–1.75)
Retirement time				
Up to 10 years	40	43.0 (32.9–53.1)		1
More than 10 years	35	21.1 (14.9–27.3)	0.208	1.23 (0.89–1.71)
Marital status				
Married	49	45.6 (32.7–57.7)		1
Others	26	45.6 (32.7–58.5)	0.771	0.95 (0.67–1.35)
Type of retirement				
By age	13	59.1 (38.5–79.6)		1
By time of service	57	46.7 (37.9–55.6)	0.245	0.79 (0.53–1.18)
By disability/pension	5	33.3 (9.5–57.2)	0.159	0.56 (0.26–1.25)

Abbreviations: PR, Prevalence ratio of medication adherence, adjusted by Poisson regression with robust variance; 95% CI, 95% confidence intervals.

poor treatment adherence on the Morisky Medication Adherence Scale (MMAS). These studies all show low adherence rates in a variety of countries with different populational indices, socioeconomic conditions, and governing styles. The results show that low adherence among the elderly is a global public health problem in need of effective solutions.

The proportion of low adherence found in our study in almost all of the analyzed categories, except the high-income category, suggests a possible relationship between socioeconomic factors and adherence. During this study, we also observed a lack of drug assistance at the outpatient level. That is, doctors are the only providers who are responsible for advising elderly patients on medication use, and they only have limited office visit hours to provide this patient education. For elderly insulin-dependent diabetic patients in endocrinology outpatient clinics, nurses are responsible for teaching them the correct use of glucometers and insulin application techniques. International literature recommends using a comprehensive and team-based approach (involving other healthcare professionals, such as pharmacists and nurses), as they have positive results on adherence.[23–25]

The role of family support in treatment adherence—although not evaluated formally in this study—has emerged as a likely mediating factor between physicians and their elderly patients, even those with preserved cognitive ability. As adherence has been found to be higher in older adults with higher household incomes, there may be a relationship between high income and adequate family support. Therefore, professionals could work together with families in all socioeconomic categories to seek solutions for correct medication use. Comprehensive medication support could help avoid the preventable risks that are associated with low adherence and resultant treatment ineffectiveness, such as adverse reactions, hospitalizations, and even deaths.[31–35] Recent studies suggest that educational programs, monitoring, and gerontological follow-up could be facilitating factors. These, together with family support, could be fruitful areas for new research in elderly patients.[7,27–30,32,33,36]

The positive association found in this study between household income and medication adherence is an important advancement in this research field, especially considering the scarcity of Brazilian publications on this topic. As Brazil moves through a demographic transition and gains an increased proportion of older adults, the nation will most likely see an increase in medication consumption in a country that is already known for an above-average prevalence of polypharmacy. Polypharmacy coupled with marked social inequality and high poverty rates among the elderly could contribute to widening both the health and wealth gap in some of Brazil's most vulnerable citizens.

The only significant association found in our study between adherence and patient variables was in income level. We believe that high adherence in the high household income cohort suggests a possible relationship between medication adherence and socioeconomic factors for elderly retirees on polypharmacy regimens. However, this is different from other Brazilian publications as this study was carried out in the biggest city on the continent and with retired government workers and their families.[7,11,29] The current study found low medication adherence in elderly outpatients across most of the analyzed socioeconomic categories, except in the high household income category. We posit that this is because the Brazilian public healthcare system provides a limited amount of free medications to all residents, but senior citizens with above-average household income have more financial resources to purchase higher-cost drugs that are sold at private pharmacies. This group has the necessary financial resources to procure these medicines as well as access to other facilitators, such as the probable family support involved in monitoring medication use as part of health care.

Our findings demonstrate the need to implement public policies in the social and health spheres to meet the needs of the elderly population. Most senior citizens are retired and live in predominantly low socioeconomic conditions with probable low medication adherence. Educational programs on how medications work and the importance of taking them correctly should be implemented, with effective participation of pharmacists and nurses. This study sets a precedent for new research on adherence improvement methods, the importance of family participation in this process, and the complexity of the elderly using multiple medications, with its risks of complications and impacts on public health.

We recognize that our study presents several limitations, namely in terms of external validity. The first significant limitation is that we excluded potential participants over the age of 75 from this study. We initially did this to avoid introducing memory bias into the research study and to avoid inadvertently diagnosing dementia, which would have raised severe ethical issues. However, we recognize that this may have limited our study size and the applicability of these results to older geriatric patients; therefore, we recommend that, instead of setting age limits, future studies should apply the MMSE or other similar screening tools. Our study was also limited by the types of patients that we recruited; the endocrine and cardiology outpatient clinics were the only specialties that could provide the volume of eligible patients required for this study's sample size. In addition to limiting the age range and types of conditions, our study was also limited in terms of geographical extension. The results presented here are representative of São Paulo only, and, therefore, may not be an accurate representation of the general Brazilian situation. However, São Paulo is the largest city in South America and has some of the highest standards of living and healthcare coverage in Latin America. Thus, if adherence was low in São Paulo, areas far from major urban centers—where living conditions and healthcare coverage are worse—may see even lower adherence rates. Therefore, while our findings of specific proportions of adherence may not be valid for direct comparison with other cities/states in Brazil, our study exposes a clear need and is a call for more research and interventions on medication adherence in this country.

Conclusion

Medication adherence was low across all groups of retired senior citizens, except in the group of participants with high household income: a finding that could be key to understanding medication adherence in elderly Brazilians. Our study only focused on elderly residents below the age of 75, and future research could focus on even older geriatric patients, such as those in their 80s, 90s, or older. Future studies can use our findings on socioeconomic status to focus on understanding and improving adherence, on both public policy and clinical levels.

Author Contributions

All authors contributed to data analysis, drafting or revising the article, gave final approval of the version to be published, and agree to be accountable for all aspects of the work.

Disclosure

The authors report no conflicts of interest in this work.

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