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Polypharmacy and Its Relationship with Chronic Diseases among Older Adults Followed in Primary Health Care

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Abstract: *Objective: To analyze the prevalence of polypharmacy and the clinical and functional factors associated with the use of five or more medications among older adults followed in Primary Health Care. Material and Methods: This was an observational, cross-sectional, analytical study with a quantitative approach, conducted in a Primary Health Care unit in São Paulo, Brazil. A total of 368 older adults aged 60 years or older were assessed between August 2024 and June 2025 using the Multidimensional Assessment of Older Adults in Primary Care (AMPI-AB). Associations were estimated using Poisson regression with robust variance and are presented as prevalence ratios (PR), 95% confidence intervals (95% CI), and p-values. Results: The prevalence of polypharmacy was 41.3% (n=152). In the adjusted model, diabetes mellitus (PR=2.28; 95% CI 1.81-2.87), hypertension (PR=3.03; 95% CI 1.89-4.84), depression (PR=1.31; 95% CI 1.04-1.64), and two or more falls (PR=1.69; 95% CI 1.32-2.15) remained associated with the outcome. Conclusion: Polypharmacy was associated with chronic conditions requiring continuous management and with a marker of functional vulnerability, reinforcing the need for multidimensional assessment, medication review, and interprofessional care in Primary Health Care.*

Key Words: *polypharmacy; older adults; chronic diseases; Primary Health Care; falls; AMPI-AB.*

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I. Introduction

Population ageing is one of the most important demographic transformations of the twenty-first century and has changed morbidity and mortality profiles as well as the demands placed on health systems. The World Health Organization emphasizes that healthy ageing requires health care models that go beyond the isolated control of diseases and incorporate functionality, autonomy, social participation, and person-centered care [1].

In Brazil, this demographic transition occurs in a context of a high burden of noncommunicable chronic diseases, including hypertension, diabetes mellitus, cardiovascular diseases, depression, obesity, and osteoarticular conditions. The coexistence of two or more chronic conditions, defined as multimorbidity, challenges care organization because it increases health service use, therapeutic fragmentation, and the treatment burden imposed on older adults and their support networks [2].

Multiple chronic conditions frequently require continuous pharmacological treatment, which may favor the simultaneous use of several medications. Polypharmacy is commonly defined as the regular use of five or more medications, although the literature recognizes that the number of medications alone does not distinguish appropriate from potentially inappropriate polypharmacy [3]. A systematic review and meta-analysis estimated a global polypharmacy prevalence of 37%, highlighting the relevance of this phenomenon among older populations [4].

Although polypharmacy may be clinically necessary for the management of multimorbidity, it requires systematic monitoring. Age-related pharmacokinetic and pharmacodynamic changes increase susceptibility to adverse drug reactions, drug-drug interactions, falls, hospitalizations, functional decline, and the use of potentially inappropriate medications [5,6].

In Brazil, national studies and investigations in Primary Health Care have associated polypharmacy

with multimorbidity, poorer self-rated health, older age, and greater health service utilization [14-17]. Primary Health Care is therefore strategically positioned to provide longitudinal follow-up, coordinate care, and identify clinical, functional, cognitive, emotional, and social vulnerabilities at an early stage. Multidimensional assessment tools, such as AMPI-AB, support risk stratification and care planning within the territory [7]. This study aimed to analyze the prevalence of polypharmacy and the clinical and functional factors associated with the use of five or more medications among older adults followed in Primary Health Care.

II. Material and Methods

Study design and setting

This was an observational, cross-sectional, analytical study with a quantitative approach, conducted with older adults followed in a Basic Health Unit located in the city of São Paulo, Brazil. The manuscript was organized according to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement, which guides transparent reporting of observational studies [8].

A cross-sectional design was adopted because it allows the estimation of polypharmacy prevalence and the analysis of its association with sociodemographic, clinical, and functional characteristics at a single point in time. Therefore, the associations identified in this study should be interpreted as prevalence relationships, without causal or temporal inference.

Participants and recruitment

The eligible population consisted of adults aged 60 years or older registered and followed by the Jardim Cliper Basic Health Unit. At the time of the study, approximately 5,000 older adults were registered in the local health system. Data were collected between August 2024 and June 2025 as part of routine care, including older adults assessed at the unit or during home visits.

Inclusion and exclusion criteria

Participants were included if they were aged 60 years or older, lived in the territory covered by the Jardim Cliper Basic Health Unit, agreed to participate, and signed an informed consent form. Older adults with severe cognitive impairment that prevented comprehension of the questions, as well as those who refused participation or declined to sign the consent form, were excluded.

Sample size, instrument, and variables

The sample size was calculated for a finite population, considering a 95% confidence level, a 5% absolute sampling error, and a conservative expected proportion of 50%. For an estimated population of 5,000 registered older adults, the minimum sample size was 357 participants [9]. The final sample included 368 older adults. The Multidimensional Assessment of Older Adults in Primary Care (AMPI-AB) was used to assess clinical, functional, cognitive, emotional, and social dimensions relevant to risk stratification and care planning in Primary Health Care [7].

The dependent variable was polypharmacy, defined as the use of five or more medications [3]. Independent variables included sex, age, age group, categorized body mass index, self-rated health, diabetes mellitus, hypertension, depression, coronary artery disease, obesity, and falls.

Statistical analysis and ethical aspects

Statistical analysis was performed using Stata, version 16. Categorical variables were described using absolute and relative frequencies. Age was described using mean, standard deviation, median, and interquartile range. Associations were estimated using Poisson regression with robust variance, with prevalence ratios (PR), 95% confidence intervals (95% CI), and p-values. This approach was selected because the outcome was prevalent in a cross-sectional study, a situation in which the prevalence ratio is more interpretable than the odds ratio [10,11]. The significance level was set at 5%.

All participants signed an informed consent form before inclusion. The research project was approved by the Research Ethics Committee of the University of São Paulo under opinion number 6,877,049 and complied with Brazilian National Health Council Resolution No. 466/2012 and the ethical principles of the Declaration of Helsinki [12,13].

III. Results

A total of 368 older adults were analyzed. Of these, 152 had polypharmacy, corresponding to a prevalence of 41.3%. The remaining 216 participants (58.7%) did not have the outcome. Mean age was 70.5 +/- 7.6 years among participants without polypharmacy and 71.9 +/- 7.6 years among those with polypharmacy.

The clinical profile showed that polypharmacy was concentrated among older adults with a greater burden of chronic conditions. Among participants with polypharmacy, 57.2% had diabetes mellitus, compared with

17.6% among those without polypharmacy. Hypertension was present in 90.8% of participants with polypharmacy and in 58.8% of those without the outcome. A poorer perceived and functional health profile was also observed: regular, poor, or very poor self-rated health was reported by 57.9% of participants with polypharmacy, and two or more falls were reported by 22.4% of this group.

Table 1: Sociodemographic and clinical characteristics according to polypharmacy status

Variable	Category	Without polypharmacy n (%)	With polypharmacy n (%)
Sex	Female	174 (80.6)	117 (77.0)
Sex	Male	42 (19.4)	35 (23.0)
Age group	60-69 years	104 (48.1)	57 (37.5)
Age group	70-79 years	83 (38.4)	69 (45.4)
Age group	80 years or older	29 (13.4)	26 (17.1)
BMI category	<22 kg/m(2)	31 (14.4)	14 (9.2)
BMI category	22-27 kg/m(2)	84 (38.9)	45 (29.6)
BMI category	>27 kg/m(2)	101 (46.8)	93 (61.2)
Self-rated health	Very good/good	131 (60.6)	64 (42.1)
Self-rated health	Regular/poor/very poor	85 (39.4)	88 (57.9)
Diabetes mellitus	No	178 (82.4)	65 (42.8)
Diabetes mellitus	Yes	38 (17.6)	87 (57.2)
Hypertension	No	89 (41.2)	14 (9.2)
Hypertension	Yes	127 (58.8)	138 (90.8)
Depression	No	158 (73.1)	97 (63.8)
Depression	Yes	58 (26.9)	55 (36.2)
Coronary artery disease	No	203 (94.0)	123 (80.9)
Coronary artery disease	Yes	13 (6.0)	29 (19.1)
Obesity	No	202 (93.5)	131 (86.2)
Obesity	Yes	14 (6.5)	21 (13.8)
Falls	None	169 (78.2)	97 (63.8)
Falls	One episode	34 (15.7)	21 (13.8)
Falls	Two or more	13 (6.0)	34 (22.4)

Source: prepared by the authors based on the study data. BMI: body mass index.

In the bivariate analysis, BMI >27 kg/m(2), regular/poor/very poor self-rated health, diabetes mellitus, hypertension, depression, coronary artery disease, obesity, and two or more falls were associated with polypharmacy. In the multivariable model adjusted for age, sex, diabetes mellitus, hypertension, depression, coronary artery disease, obesity, and falls, diabetes mellitus, hypertension, depression, and two or more falls remained associated with the outcome.

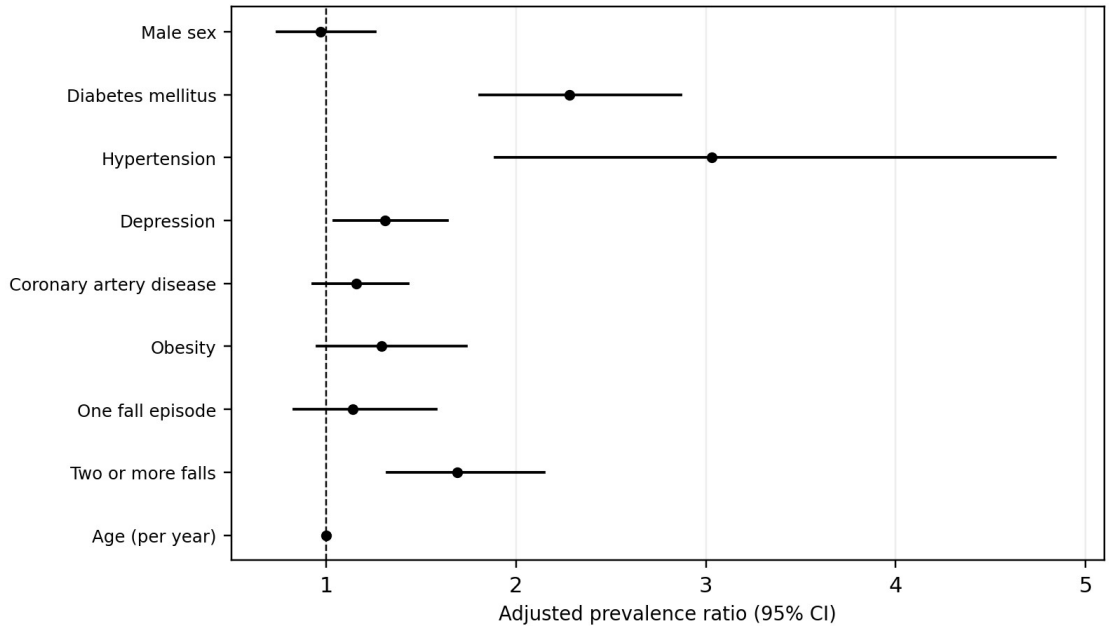
Table 2: Adjusted multivariable model for polypharmacy

Variable	Adjusted PR	95% CI	p-value
Male sex	0.97	0.74-1.26	0.808
Diabetes mellitus	2.28	1.81-2.87	<0.001
Hypertension	3.03	1.89-4.84	<0.001
Depression	1.31	1.04-1.64	0.020
Coronary artery disease	1.16	0.93-1.43	0.187
Obesity	1.29	0.95-1.74	0.098
One fall episode	1.14	0.83-1.58	0.419
Two or more falls	1.69	1.32-2.15	<0.001
Age (per year)	1.00	0.99-1.02	0.810

Note: adjusted model estimated using Poisson regression with robust variance. PR: prevalence ratio; 95% CI: 95% confidence interval.

Hypertension showed the highest magnitude of association in the final model. Older adults with hypertension had a prevalence of polypharmacy approximately three times higher than those without hypertension (PR=3.03; 95% CI 1.89-4.84). Diabetes mellitus also showed a strong association, with a prevalence of polypharmacy more than twice as high among participants with diabetes (PR=2.28; 95% CI 1.81-2.87). Depression remained associated with the outcome with a smaller but statistically significant magnitude (PR=1.31; 95% CI 1.04-1.64), and two or more falls also remained independently associated with polypharmacy (PR=1.69; 95% CI 1.32-2.15).

Figure 1: Forest plot of adjusted prevalence ratios for polypharmacy



Source: prepared by the authors based on the adjusted model.

IV. Discussion

This study analyzed the prevalence of polypharmacy and the factors associated with the use of five or more medications among older adults followed in Primary Health Care. The main finding was that polypharmacy affected 41.3% of participants and was associated, in the adjusted model, with diabetes mellitus, hypertension, depression, and two or more falls. These findings indicate that polypharmacy was not randomly distributed in the sample but was concentrated among older adults with greater cardiometabolic, mental health, and functional complexity.

The prevalence observed in this study was similar to the global estimate reported in a systematic review and meta-analysis and was consistent with Brazilian studies that identify polypharmacy as a frequent condition among older adults, especially those with multimorbidity and greater use of health services [4,14-17]. This reinforces polypharmacy as a relevant public health issue in Primary Health Care, where longitudinal follow-up creates an opportunity to periodically review therapeutic plans and reduce preventable medication-related harm.

The strong associations with hypertension and diabetes mellitus were expected, since these conditions usually require continuous pharmacological treatment for blood pressure control, glycemic control, and prevention of cardiovascular complications. However, therapeutic intensity should be accompanied by systematic prescription review, especially in older adults with frailty, falls, functional limitations, or reduced physiological reserve. The challenge in Primary Health Care is not merely to reduce the number of medications, but to distinguish necessary polypharmacy from potentially inappropriate polypharmacy [3,5].

Depression also remained associated with polypharmacy, suggesting that mental health is part of the therapeutic complexity profile of older adults. This finding is relevant because depressive symptoms may coexist with chronic pain, sleep disturbances, social isolation, low treatment adherence, and greater health service use. In addition, medications used to manage emotional symptoms, sleep, and pain may increase the risk of sedation, dizziness, hypotension, drug interactions, and falls, particularly when combined with antihypertensive drugs, antidiabetic agents, or other chronic-use medications [5,6].

Two or more falls remained independently associated with polypharmacy. Because this was a cross-sectional study, it is not possible to determine whether polypharmacy preceded falls, whether falls led to additional prescribing, or whether both conditions reflect greater clinical vulnerability. Nevertheless, the association is important for practice. Previous studies have reported an association between multiple medication use and increased fall risk among older adults [18]. In Primary Health Care, the identification of polypharmacy should trigger investigation of previous falls, fear of falling, postural hypotension, dizziness, gait and balance disorders, and medications potentially associated with falls.

The findings also reinforce the importance of interprofessional care. Medication review, medication reconciliation, health education, and planned deprescribing may reduce medication-related harm when

performed through shared decision-making and person-centered care. Recent evidence highlights deprescribing as a feasible and clinically relevant strategy to individualize care for older adults with polypharmacy, particularly when medications lack a current indication, when therapeutic duplication is present, or when the risk-benefit balance becomes unfavorable [19,20].

For Physiotherapy and other health professions, polypharmacy should be understood as a marker of complexity rather than only a medication count. Older adults with polypharmacy may require more detailed functional assessment, fall-risk screening, guidance for safe physical activity, strengthening, balance training, education for self-care, and articulation with physicians, nurses, pharmacists, psychologists, and community health workers. AMPI-AB may support this process by integrating clinical, functional, cognitive, emotional, and social dimensions of older adults in Primary Health Care [7].

This study has limitations. Its cross-sectional design prevents causal or temporal inference between polypharmacy, chronic diseases, and falls. Convenience recruitment in a single Basic Health Unit limits the generalizability of the findings to other territories. Some clinical information may depend on health records or self-report, with possible information bias. In addition, the definition of polypharmacy was based on medication count and did not allow differentiation between appropriate polypharmacy and potentially inappropriate prescribing. Despite these limitations, the study has strengths, including a sample size above the calculated minimum, the use of a multidimensional assessment tool in a real Primary Health Care context, and adjusted analysis using Poisson regression with robust variance.

V. Conclusion

Polypharmacy showed a high prevalence among the older adults evaluated, affecting 41.3% of the sample. In the adjusted model, diabetes mellitus, hypertension, depression, and two or more falls remained associated with the use of five or more medications.

These findings indicate that polypharmacy, in the context of Primary Health Care, reflects greater clinical and functional complexity. Older adults with polypharmacy should therefore be followed through a multidimensional and interprofessional approach, including periodic medication review, fall-risk identification, strengthening of self-care, and therapeutic planning centered on functionality, medication safety, and quality of life.

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Author Contributions

Carolina Romani Baseggio, Giovana La Rubbia Savino, Giovana Módolo Calça, Isabela Cristina Barbosa, Julia Santos Silva, Mariana Rodrigues Soares, Sara Capelini de Souza, and Victória Cristina Viana participated in study organization, data collection, data systematization, and discussion of the findings. Mirian Akemi Onoue and Luciano Sencovici contributed to critical review of the manuscript and academic guidance. Thuam Silva Rodrigues participated in study conception, methodological guidance, analysis, writing, and final manuscript review.

The authors declare no conflicts of interest.

Conflict of Interest

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