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Polypharmacy in Patients with Neurological Injuries in a Public Hospital Rehabilitation Unit in the Federal District: a cross-sectional study

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Abstract

Purpose: To estimate the prevalence of polypharmacy in patients admitted to a rehabilitation unit in Brazil and investigate associations with sociodemographic and clinical characteristics. **Methods:** A descriptive and analytical cross-sectional study with retrospective data collection from 99 patients admitted to the rehabilitation unit in the Federal District, Brazil, between January and December 2022. Patients aged ≥18 years with neurological injuries who were discharged from the hospital were included, excluding those with incomplete data or communication difficulties. Variables such as age, sex, race/color, nutritional status, level of functional dependence, and the presence of hypertension, diabetes and dyslipidemia were analyzed. The number of medications was categorized as less than 5, 5 to 9, and 10 or more, and associations were assessed using Fisher's exact test ($p<0.05$). **Results:** Among the evaluated patients (n = 99), polypharmacy was identified in 90.9% of cases, with a mean of 8.59 ± 3.06 medications per patient. Regarding the sociodemographic profile, 71.7% were male and the mean age was 46.1 ± 15.4 years. The most common injuries were traumatic spinal cord injuries (40.4%) and non-traumatic brain injuries (21.3%). A significant association was found between polypharmacy and sex, nutritional status, and diabetes. **Conclusion:** The high prevalence of polypharmacy in rehabilitation patients highlights the complexity of their clinical management and underscores the need for pharmaceutical care in this population.

Keywords: Polypharmacy, Nutritional Status, Chronic Conditions, Neurological Disorders, Subacute Care.

Polifarmácia em Pacientes com Lesões Neurológicas em Unidade Hospitalar Pública de Reabilitação, no Distrito Federal: um estudo transversal

Resumo

Objetivo: estimar a prevalência de polifarmácia em pacientes internados em uma unidade de reabilitação no Brasil e investigar associações com características sociodemográficas e clínicas. **Métodos:** estudo descritivo e analítico, transversal, com coleta de dados retrospectivos de 99 pacientes internados na unidade de reabilitação no Distrito Federal, Brasil, entre janeiro e dezembro de 2022. Foram incluídos pacientes com idade ≥18 anos, com lesões neurológicas que receberam alta hospitalar, excluindo-se aqueles com dados incompletos ou dificuldades de comunicação. Variáveis como idade, sexo, raça/cor, estado nutricional, nível de dependência funcional e presença de hipertensão, diabetes e dislipidemia foram analisadas. O número de medicamentos foi categorizado em menos de 5, de 5 a 9, e 10 ou mais, e associações foram avaliadas pelo teste exato de Fisher ($p<0,05$). **Resultados:** dos pacientes avaliados (n=99), a polifarmácia foi identificada em 90,9% dos casos, com média de 8,59 ± 3,06 medicamentos por paciente. Quanto ao perfil sóciodemográfico, 71,7% eram homens e a média de idade foi 46,1 ± 15,4 anos. As lesões mais comuns foram traumáticas da medula espinhal (40,4%) e cerebrais não traumáticas (21,3%). Houve associação significativa entre polifarmácia e sexo, estado nutricional e diabetes. **Conclusão:** a elevada prevalência de polifarmácia em pacientes em reabilitação evidencia a complexidade do seu manejo clínico e indica a necessidade do cuidado farmacêutico nestes pacientes.

Palavras-chave: Polifarmácia, Estado Nutricional, Condições Crônicas, Distúrbios Neurológicos, Cuidados Pós-Agudos.

Introduction

The concurrent use of multiple medications is a frequent condition among patients with neurological injuries and requires special attention to the pharmacotherapy employed[1].

Polypharmacy is generally defined as the use of five or more medications, while hyperpolypharmacy is characterized by the use of 10 or more drugs[2]. Several studies highlight the association between polypharmacy, the use of potentially inappropriate medications, and functional decline, particularly in older adults[3,4]. These conditions are linked to reduced mobility, functional impairment, cognitive decline, increased risk of falls and fractures, as well as difficulties in activities of daily living[5–7].

In addition, excessive medication use can lead to significant adverse effects, such as metabolic alterations, loss of appetite, and impaired nutritional status, thereby hindering the recovery process during rehabilitation[8].

On the other hand, pharmacotherapy is essential in the clinical management of patients with neurological injuries, often being necessary for controlling chronic comorbidities, motor symptoms, spasticity, pain, and mood disorders. When used rationally, polypharmacy can contribute to clinical stabilization and the achievement of positive functional outcomes, such as improved physical performance and greater engagement in rehabilitation activities[9–12].

Despite the importance of this topic, few studies specifically address polypharmacy in patients with neurological injuries, particularly in hospital rehabilitation settings. Most research focuses on population-based data obtained from household surveys or investigations in primary healthcare services[13,14]. This gap highlights the need for studies that consider the clinical complexity and therapeutic profiles of these patients within the hospital context of the Brazilian Unified Health System (SUS).

Accordingly, this cross-sectional study, conducted in a public hospital rehabilitation unit in the Federal District of Brazil, aims to estimate the prevalence of polypharmacy among patients with neurological injuries and investigate its associations with sociodemographic and clinical variables.

Methods

This is a descriptive and analytical cross-sectional study with retrospective data collection from patients treated at the Rehabilitation and Long-Term Care Unit of a public hospital in the Federal District (FD), Brazil. Data were obtained through the computerized system of the State Health Department of the Federal District (SES-DF), the Integrated Health System – SIS TrakCare.

Inclusion criteria were patients aged over 18 years, admitted between January and December 2022, who had motor function loss and/or cranial nerve impairment (affecting speech and swallowing) due to neurological injuries and were discharged from the hospital. Patients who were hospitalized and unable to communicate at the time of the study—thus preventing the obtainment of informed consent—were excluded.

The analyzed variables included data collected at the time of admission—sociodemographic (age, sex, race/color, marital status, social and economic vulnerability, and educational level), history of smoking, alcohol and drug use, presence of comorbidities (hypertension, diabetes, and dyslipidemia), and type of injury—and at hospital discharge—nutritional status, functional impact, level of dependence, and prescribed medications (quantity, name, and ATC [Anatomical Therapeutic Chemical] code).

Vulnerability was assessed from both social and economic perspectives, considering variables such as income range, social assistance benefits, and social support networks. The analysis employed a classification developed by the hospital team based on the National Social Assistance Policy (PNAS/2004) and the theories of Robert Castel[15] (1997). In this classification, social vulnerability is stratified into three levels of complexity: low: individuals with personal income and preserved family and/or community ties (integration zone); medium: individuals with compromised personal income and weakened family and/or community ties (vulnerability zone); high: individuals with no income and broken family ties (disaffiliation zone).

Nutritional status assessment was based on the last evaluation recorded by the nutritionists, usually at hospital discharge. For adults aged 20–59 years, the criteria from the World Health Organization (WHO, 1995) were used, classifying BMI as: underweight (< 18.5 kg/m²), normal (≥ 18.5 and < 25.0 kg/m²), overweight (≥ 25.0 and < 30.0 kg/m²), and obesity (≥ 30.0 kg/m²). For elderly individuals aged 60 years or older, the criteria from the Nutrition Screening Initiative (1994) were adopted, with the following BMI cut-off points: underweight (≤ 22.0 kg/m²), adequate or eutrophic (> 22.0 and < 27.0 kg/m²), and overweight (≥ 27.0 kg/m²).

The level of dependence at discharge was determined based on medical record entries of the Functional Independence Measure (FIM) scores[16].

Considering the concepts of polypharmacy and hyperpolypharmacy[2], the number of prescribed medications was categorized into three groups: fewer than 5, between 5 and 9, and 10 or more medications. This classification was used in data analysis to assess the prevalence of multiple drug use among study participants. Only continuously used medications were considered for the analysis of the most prescribed drugs; those prescribed "as needed" were excluded to ensure greater accuracy in assessing prescription patterns.

Data were collected by four researchers and reviewed by two others, ensuring higher accuracy and reliability. Measures of central tendency and dispersion were applied, along with absolute and relative frequencies to describe the variables. The association between the number of medications and the independent variables was evaluated using Fisher's exact test, with the significance level set at $p < 0.05$. The strength of associations was measured using Cramér's V coefficient.

All medical records of patients hospitalized during the study period were analyzed, according to the established inclusion and exclusion criteria. Some specific clinical information, such as functional impact and level of dependence, was not available for all patients. Therefore, the number of participants varied across analyses depending on data availability, which explains differences in the total number of patients for some variables. Statistical analyses were conducted using R software, version 4.4.1.

This study is part of the project *"Prescription patterns and sociodemographic characteristics of patients treated at a Reference Rehabilitation Unit in the Federal District"*, approved by the Research Ethics Committee (REC) for Human Subjects of the Ceilândia College at the University of Brasília (CEP-FCE), under CAAE No. 71118923.3.0000.8093, and by the REC of the Foundation for Teaching and Research in Health Sciences (FEPECS/SES/DF), under CAAE No. 71118923.3.3001.5553.

Results

A total of 99 patient medical records were analyzed, with 867 medications prescribed at hospital discharge, resulting in an average of 8.59 ± 3.06 medications per patient. In the analysis of the number of medications prescribed per patient at discharge (Table 1), a high prevalence of polypharmacy was observed in 90.9% of patients; among these, 44.4% were prescribed 10 or more medications (hyperpolypharmacy).

Hyperpolypharmacy was observed in 60% of men, 91.4% of non-white individuals, younger patients (aged 18 to 39; 32.5%), patients without social vulnerability (86.5%), those who were overweight or obese (55.5%), individuals with tetraparesis or tetraplegia (47.2%), and those with complete or modified dependence (55.9%).

Regarding sex, 71 patients (71.7%) were male and 28 (28.3%) female. The average age was 46.1 ± 15.4 years. Among patients with traumatic injuries (51; 51.5%), there was a predominance of males (45; 88.2%) and younger individuals (average age 41.0 ± 15.4 years). In contrast, stroke was the leading cause among older patients (95.2%), with a mean age of 54.3 ± 10.4 years. As for education level, 58.6% of patients had not completed high school.

The most frequent type of injury was traumatic spinal cord injury, affecting 40 patients (40.4%). Non-traumatic brain injuries were the second most common, with 21 cases (21.3%), with stroke being the leading cause. Peripheral injuries were found in 16 patients (16.2%), with post-intensive care syndrome and Guillain-Barré syndrome being the most prevalent causes. Traumatic brain injuries occurred in 11 patients (11.1%), while non-traumatic spinal cord injuries affected 9 patients (9.0%). Other types of injury were recorded in 2 patients (2.0%).

Marital status and economic vulnerability showed similar distributions across groups. Smoking, alcohol consumption, drug abuse, hypertension, and diabetes were less prevalent in patients with polypharmacy compared to those without these comorbidities and harmful habits.

Significant associations of moderate strength were found between sex, nutritional status, and diabetes with the number of prescribed medications ($p < 0.05$), with Cramér's V values of 0.26, 0.25, and 0.26, respectively.

Male patients showed a higher frequency of prescribed medications across all categories, especially in the range of 5 to 9 medications (76.0%). Although less frequent, female patients demonstrated a progressive increase in medication use, with 57.1% of women using 10 or more medications.

Eutrophic patients also presented higher proportions across all categories of prescribed medications, with the 5 to 9 medications range standing out (54.0%). However, all individuals who were overweight or obese fell into the polypharmacy category.

Similarly, patients without diabetes had a higher frequency in the number of prescribed medications, particularly in the 5 to 9 medications range (76.0%). Although fewer in number, all patients with diabetes were in the polypharmacy category, with 66.7% using 10 or more medications.

The prescription pattern revealed that the most frequently used continuous-use medications at hospital discharge were those intended for pain management, with gabapentin (8.7%) being the most prominent (Table 2).

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Table 1. Factors associated with the number of medications prescribed at hospital discharge (n = 99)

Variables	Medications Prescribed			p-value*
	Fewer than 5	5 to 9	10 or more	
	n (%)	n (%)	n (%)	
Sex				<0.05
Female	0 (0.0)	12 (24.4)	16 (40.0)	
Male	9 (100.0)	38 (76.0)	24 (60.0)	
Race/Color				0.31
White	2 (22.2)	8 (19.0)	3 (8.6)	
Non-white	7 (77.8)	34 (81.0)	32 (91.4)	
Age group				0.67
18 to 39	4 (44.4)	15 (30.0)	13 (32.5)	
40 to 49	1 (11.1)	15 (30.0)	7 (17.5)	
50 to 59	3 (33.3)	14 (28.0)	11 (27.5)	
60 or more	1 (11.1)	6 (12.0)	9 (22.5)	
Education level				0.65
No formal education	1 (11.1)	3 (6.0)	1 (2.5)	
Primary education	5 (55.6)	19 (38.0)	18 (45.0)	
Secondary education	3 (33.3)	18 (36.0)	13 (32.5)	
Higher education	0 (0.0)	10 (20.0)	8 (20.0)	
Marital status				1.00
With partner	4 (44.4)	23 (46.0)	18 (45.0)	
Without partner	5 (55.6)	27 (54.0)	22 (55.0)	
Economic vulnerability				0.77
High complexity	3 (33.3)	15 (31.9)	8 (21.6)	
Medium complexity	4 (44.4)	16 (34.0)	15 (40.5)	
Low complexity	2 (22.2)	16 (34.0)	14 (37.8)	
Social vulnerability				0.74
High complexity	1 (11.1)	2 (4.2)	1 (2.7)	
Medium complexity	1 (11.1)	6 (12.5)	4 (10.8)	
Low complexity	7 (77.8)	40 (83.3)	32 (86.5)	
Nutritional status at discharge				<0.05
Underweight	2 (22.2)	2 (4.0)	4 (10.0)	
Adequate or eutrophic	7 (77.8)	27 (54.0)	14 (35.0)	
Overweight	0 (0.0)	9 (18.0)	12 (30.0)	
Obesity	0 (0.0)	12 (24.0)	10 (25.0)	
Avaliação neurofuncional na alta				0.42
Hemiparesis and hemiplegia	3 (33.3)	17 (39.5)	6 (16.7)	
Paraparesis and paraplegia	2 (22.2)	9 (20.9)	10 (27.8)	
Tetraparesis and tetraplegia	3 (33.3)	14 (32.6)	17 (47.2)	
Not assessed	1 (11.1)	3 (7.0)	3 (8.3)	
Level of dependency at discharge				0.14
Complete dependency	3 (37.5)	2 (5.4)	7 (20.6)	
Modified dependency	1 (12.5)	11 (29.7)	12 (35.3)	
Complete/modified independence	3 (37.5)	21 (56.8)	12 (35.3)	
Not assessed	1 (12.5)	3 (8.1)	3 (8.8)	
Smoking status				0.09
Yes	5 (55.6)	9 (18.0)	11 (27.5)	
No	4 (44.4)	34 (68.0)	20 (50.0)	
Former smoker	0 (0.0)	7 (14.0)	9 (22.5)	
Alcohol consumption				0.07
Yes	6 (66.7)	12 (24.0)	13 (32.5)	
No	3 (33.3)	33 (66.0)	19 (47.5)	
Former drinker	0 (0.0)	5 (10.0)	8 (20.0)	
Drug use and abuse				0.36
No	9 (100.0)	45 (90.0)	33 (82.5)	
Yes	0 (0.0)	5 (10.0)	7 (17.5)	
Arterial hypertension				0.49
No	7 (77.8)	28 (56.0)	24 (60.0)	
Yes	2 (22.2)	22 (44.0)	16 (40.0)	
Diabetes				<0.05
No	9 (100.0)	44 (88.0)	28 (70.0)	
Yes	0 (0.0)	6 (12.0)	12 (30.0)	
Dyslipidemia				0.31
No	9 (100.0)	38 (76.0)	30 (75.0)	
Yes	0 (0.0)	12 (24.0)	10 (25.0)	
Type of injury				0.09
Non-traumatic	2 (22.2)	22 (44.0)	24 (60.0)	
Traumatic	7 (77.8)	28 (56.0)	16 (40.0)	

Legend: absolute frequency (n) and relative frequency (%); *Fisher's exact test.

Table 2. Most commonly prescribed chronic-use medications for patients at hospital discharge (n = 712)

ATC Code	Medication	n (%)
N02BF01	Gabapentin	62 (8.7)
A02BC01	Omeprazole	54 (7.6)
A06AD11	Lactulose	44 (6.2)
C09CA01	Losartan	32 (4.5)
N03AE01	Clonazepam	26 (3.7)
C08CA01	Amlodipine	26 (3.7)
A03AX13	Simethicone	26 (3.7)
N06AA09	Amitriptyline	23 (3.2)
G04BD04	Oxybutynin	23 (3.2)
M03BX01	Baclofen	22 (3.0)
N06AB03	Fluoxetine	20 (2.8)
C10AA01	Simvastatin	19 (2.7)
A06AB02	Bisacodyl	19 (2.7)
N02BB02	Dipirone	18 (2.5)
B01AC06	Acetylsalicylic Acid	15 (2.1)
M03BX08	Cyclobenzaprine	15 (2.1)
N05AH04	Quetiapine	13 (1.8)
A10BA02	Metformin	12 (1.7)
C03BA11	Indapamide	10 (1.4)
N03AF01	Carbamazepine	10 (1.4)
N02BE01	Paracetamol	10 (1.4)
N07BC02	Methadone	8 (1.1)
	Others	205 (28.8)
	Total	712 (100)

Legend: absolute frequency (n) and relative frequency (%)

Discussion

Although two other studies have previously explored this same population, focusing on sociodemographic, clinical, pharmacotherapeutic profiles and access to medicines[17,18], this is the first study in Brazil to investigate the prevalence of polypharmacy in patients with neurological injuries admitted to a rehabilitation unit and its associations with clinical and sociodemographic factors. The findings highlight the complexity of pharmacological management in this population and contribute to a better understanding of their specific therapeutic needs.

The survey revealed a high prevalence of polypharmacy, with 90.9% of patients using five or more medications, and 44.4% using 10 or more medications, with an average of 8.59 ± 3.06 drugs per patient. These numbers significantly exceed those reported in other populations[19], reflecting the clinical complexity of managing patients with neurological injuries, which are characterized by multiple complications secondary to the injury. The analysis of the prescribed medications, according to the Anatomical Therapeutic Chemical (ATC) classification, showed a higher concentration in the groups related to the nervous system, alimentary tract and metabolism, cardiovascular system, and musculoskeletal system. This distribution highlights the need for specific interventions in the post-injury period, addressing pain control, intestinal constipation, spasticity, mood disorders, and the management of chronic comorbidities such as hypertension, diabetes, and dyslipidemia (Table 2).

Similar results were found in a cohort study in South Korea, which identified that patients with disabilities had the highest average number of prescribed medications (7.7 ± 2.8 drugs)[20], and another study involving patients with spinal cord injury[24], in which individuals with polypharmacy used an average of 11 medications, mainly targeting the nervous and musculoskeletal systems.

Patients with neurological conditions often present complex physical and cognitive symptoms, combined with emotional and social challenges, which result in a greater need for medications and an increased risk of drug-related problems[1,22]. The severity of the injuries directly contributes to polypharmacy due to the higher incidence of post-injury clinical complications[23].

Patients with hemiparesis or hemiplegia, frequently associated with stroke, were more concentrated in the group using 5 to 9 medications. A higher prevalence of hyperpolypharmacy was observed among patients with paraparesis or paraplegia (27.8%), and especially among those with tetraparesis or tetraplegia (47.2%). In contrast, in the study by Kitzman, Cecil, and Kolpek[24] (2017), most patients fell into the polypharmacy category, with 62% of those with paraplegia and 57% of those with tetraplegia using 5 to 9 medications.

In terms of functionality, patients with complete or modified dependence accounted for 55.9% of the hyperpolypharmacy group, compared to 35.3% of individuals with complete or modified independence. This finding is particularly relevant in the rehabilitation context, especially in light of previous studies linking polypharmacy to functional decline. A multicenter longitudinal observational study by Fabbietti *et al*. (2018) involving 733 patients aged >65 years in geriatric and internal medicine wards in Italy[25] found an association between hyperpolypharmacy and functional decline, regardless of the use of potentially inappropriate medications (PIMs). Similarly, a study in Japan[26] that analyzed 361 stroke patients (mean age 78.3 years; 49.3% male) found polypharmacy in 43.8% at admission and 62.9% at discharge, which was negatively associated with activities of daily living (ADLs). These findings reinforce the importance of monitoring polypharmacy in rehabilitation populations, given its impact on functionality.

Unlike studies that associate the prevalence of polypharmacy with older adults, females, individuals with obesity, and those with comorbidities such as hypertension, diabetes, and dyslipidemia[13,27-29], in this study, polypharmacy was more prevalent among men (n = 62; 87.3%), eutrophic individuals (n = 41; 41.4%), and young adults aged 18 to 39 years (n = 28; 28.3%). Additionally, hypertension, dyslipidemia, smoking, and alcohol consumption were not significantly associated with the number of prescribed medications.

Patients without hypertension, without diabetes, and those who did not use illicit drugs showed a higher proportion in the polypharmacy groups. Moreover, harmful habits such as smoking and alcohol consumption, including former smokers and former drinkers, were similarly distributed among non-smokers and non-drinkers. These findings suggest that the pattern of polypharmacy in this sample is not limited to chronic conditions commonly associated with excessive medication use.

Even though metabolic risks—including high systolic blood pressure, high body mass index, elevated fasting glucose, high total cholesterol—and behavioral factors such as smoking and excessive alcohol consumption are known risk factors for stroke[30], and medication use increases after the event to prevent recurrence[31], the apparent divergence of findings in this study may be explained by the unique characteristics of the population involved.

Although some of the social variables analyzed, such as race/skin color, education level, and degree of social and economic vulnerability, did not show statistically significant associations with the number of prescribed medications, their inclusion in Table 1 helps characterize the social profile of the study sample. Most patients with polypharmacy were non-white, had low educational attainment, and were classified within medium or low socioeconomic vulnerability. These data, although not conclusive from a statistical perspective, suggest patterns that warrant attention and raise relevant hypotheses about the role of social determinants in the pharmacotherapeutic profile of these patients. The high prevalence of polypharmacy among these individuals—mostly non-white, with low educational levels, and facing economic vulnerability—reflects structural disparities that transcend biomedical issues and are tied to broader social, economic, and racial inequalities[32-34].

Socially vulnerable populations are disproportionately affected by external causes, such as traffic accidents and violence, which are the leading causes of disability and death among men in Brazil, particularly in large urban centers[32,33], as well as by greater exposure to accidents related to hazardous occupational activities, such as working at heights[35-38]. Furthermore, men's lower adherence to preventive healthcare services and greater access through emergency care illustrate a detachment from primary care, thereby worsening clinical outcomes[32].

These factors are direct consequences of the social and economic inequalities that disproportionately affect populations living in poverty in Brazil[39]. This finding is consistent with the study conducted by IPEA[34] (2023), which demonstrated that racial inequality in access to healthcare in Brazil is deeply intertwined with income inequality, directly impacting the ability of historically marginalized populations to treat and prevent diseases.

Among women, a progressive increase in medication use was observed, with 57.1% using 10 or more medications, while men were mostly concentrated in the group using between 5 and 9 medications (53.5%). This finding aligns with studies indicating a higher prevalence of disease among females, greater life expectancy compared to males, and increased susceptibility to medicalization[29]. Thus, when analyzing Table 1 horizontally, a greater expression of polypharmacy is observed among women.

The same trend was observed in overweight and obese patients, who had a higher prevalence of polypharmacy. Among overweight individuals, 57.1% used 10 or more medications, and this proportion was even higher among diabetic patients, with 66.7% using 10 or more drugs. Data from the National Survey on Access, Use, and Promotion of Rational Use of Medicines (PNAUM)[13] support this association, indicating a polypharmacy prevalence of 26.0% among obese individuals and 36.0% among those with chronic diseases such as diabetes. Additionally, Silveira, Dalastra, and Pagotto (2014) identified a significant relationship between polypharmacy, eutrophic status, and obesity[29].

Although underweight patients were less represented in the sample, they showed a marked trend toward increased medication use. The proportion of drugs used by these patients doubled between the groups using 5 to 9 and 10 or more prescribed medications. These individuals, with a median age of 56.5 years (40.2 – 61.2 years), exhibited lower functionality, with five out of eight patients showing complete or modified dependence. These findings are consistent with studies that associate polypharmacy with malnutrition, highlighting its negative impact on nutritional intake, muscle strength, activities of daily living, and quality of life, as well as an increased incidence of adverse health events[9,40-42]. However, such studies often focus on elderly populations. These results reinforce that nutritional status directly influences polypharmacy patterns, underscoring the need for individualized strategies in the management of these patients.

Given the high prevalence of polypharmacy observed, the need for continuous pharmacotherapeutic follow-up is evident, aimed at preventing adverse events and optimizing clinical outcomes in the rehabilitation process. Furthermore, it is emphasized that all patients with spinal cord injury are potential candidates for a multidisciplinary approach, in which the pharmacist plays a central role in monitoring and rationalizing medication use, considering the significant pharmacological burden observed in this patient profile.

Limitations

This study presents limitations inherent to its retrospective design and the use of secondary data extracted from medical records, which may have compromised the completeness of some clinical and social variables. The absence of specific data, such as functional assessment and level of dependency for some patients, may have introduced biases in subgroup analyses and influenced the interpretation of results. Additionally, the limited number of patients analyzed and the fact that the study was conducted at a single center restrict the generalizability of the findings and precluded more robust multivariate analyses, hindering the identification of interactions between variables. Nevertheless, the methodological rigor adopted and the comprehensive use of available data contributed to ensuring the internal validity of the results presented.

Future Perspectives

To further advance this line of research, multicenter studies encompassing different rehabilitation units are recommended in order to increase sample representativeness and allow for more robust analyses. A holistic approach is advised, considering medication use in the context of patients' health conditions, comorbidities, and individual needs. Future studies should investigate the use of potentially inappropriate medications, the omission of necessary treatments, and the effectiveness of interventions aimed at deprescribing inappropriate drugs.

The analysis of the number of medications, both at admission and at discharge, may help clarify whether changes in medication count during rehabilitation positively influence functional outcomes.

Additionally, it would be relevant to investigate how pre-injury conditions—such as access to and adherence to medications, lifestyle habits, and social and demographic profiles—may influence the polypharmacy observed at admission. This approach is particularly important to distinguish between factors associated with polypharmacy prior to injury and those arising from the type of injury and its clinical implications.

Conclusion

The high prevalence of polypharmacy among patients with neurological injuries reflects the complexity of clinical management in this population, which involves both preexisting comorbidities and complications secondary to the injury. The positive associations between polypharmacy and variables such as sex, presence of diabetes, and nutritional status reinforce the importance of individualized therapeutic strategies, with a focus on treatment safety and effectiveness.

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Author Contributions (CRediT Statement):

Martins AN: Project administration, investigation, formal analysis, original draft writing, and visualization

- Lopes KS: Investigation and writing – review and editing
- Castro-Neves EG: Investigation and writing – review and editing
- Lula-Barros DS: Supervision and original draft writing
- Ferreira-Medeiros EF: Writing – review and editing
- Pilger D: Writing – review and editing
- Santana EF: Investigation
- Teixeira JT: Investigation
- Rocha-Monteiro AJ: Writing – review and editing
- Matheus FC: Supervision and writing – review and editing
- Silva EV: Conceptualization, supervision, and writing – review and editing

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Conflict of Interest Statement

The authors declare no financial or personal relationships that could have influenced the work reported in this article.

References

1. Audulv Å, Hutchinson S, Warner G, *et al*. Managing everyday life: Self-management strategies people use to live well with neurological conditions. Patient Educ Couns. 2021;104(2):413-421. doi:10.1016/j.pec.2020.07.025
2. Masnoon N, Shakib S, Kalisch-Ellett L, Caughey GE. What is polypharmacy? A systematic review of definitions. BMC Geriatr. 2017;17(1):230. doi:10.1186/s12877-017-0621-2.
3. Manias E, Kabir MZ, Maier AB. Inappropriate medications and physical function: a systematic review. Ther Adv Drug Saf. 2021;12:20420986211030371. doi:10.1177/20420986211030371.
4. Yu X, Qian Y, Zhang Y, Chen Y, Wang M. Association between polypharmacy and cognitive impairment in older adults: A systematic review and meta-analysis. Geriatr Nurs. 2024;59:330-337. doi:10.1016/j.gerinurse.2024.07.005
5. Cheng CM, Chang WH, Chiu YC, *et al*. Association of Polypharmacy With Mild Cognitive Impairment and Cognitive Ability: A Nationwide Survey in Taiwan. J Clin Psychiatry. 2018;79(6):17m12043. doi:10.4088/JCP.17m12043.
6. Maust DT, Strominger J, Kim HM, *et al*. Prevalence of Central Nervous System-Active Polypharmacy Among Older Adults With Dementia in the US. JAMA. 2021;325(10):952-961. doi:10.1001/jama.2021.1195
7. Mohamed MR, Juba K, Awad H, *et al*. Effect of polypharmacy and potentially inappropriate medications on physical functional decline among older adults with advanced cancer receiving systemic treatment. Support Care Cancer. 2024;32(10):674. doi:10.1007/s00520-024-08877-6
8. Zanetti M, Veronese N, Riso S, *et al*. Polypharmacy and malnutrition in older people: A narrative review. Nutrition. 2023;115:112134. doi:10.1016/j.nut.2023.112134
9. Kose E, Wakabayashi H. Rehabilitation pharmacotherapy: A scoping review. Geriatr Gerontol Int. 2020;20(7):655-663. doi:10.1111/ggi.13975
10. Cadogan CA, Ryan C, Hughes CM. Appropriate Polypharmacy and Medicine Safety: When Many is not Too Many. Drug Saf. 2016;39(2):109-116. doi:10.1007/s40264-015-0378-5
11. Wakabayashi H. Rehabilitation pharmacotherapy: A combination of rehabilitation and pharmacotherapy. J Gen Fam Med. 2018;19(2):43-44. doi:10.1002/jgf2.163
12. Clarke CL, Witham MD. The Effects of Medication on Activity and Rehabilitation of Older People – Opportunities and Risks. Rehabilitation Process and Outcome. Adv Rehabil Sci Pract. 2017;6:1-7. doi:10.1177/1179572717711433
13. Ramos LR, Tavares NU, Bertoldi AD, *et al*. Polypharmacy and Polymorbidity in Older Adults in Brazil: a public health challenge. Rev Saude Publica. 2016;50(suppl 2):9s. doi:10.1590/S1518-8787.2016050006145
14. Sangaleti CT, Lentsck MH, Silva DCD, *et al*. Polypharmacy, potentially inappropriate medications and associated factors among older adults with hypertension in primary care. Rev Bras Enferm. 2023;76(Suppl 2):e20220785. doi:10.1590/0034-7167-2022-0785
15. Castel R. A dinâmica dos processos de marginalização: da vulnerabilidade à "desfiliação." Caderno CRH. 2006;10(26). doi:10.9771/ccrh.v10i26.18664.
16. Riberto M. Orientação funcional para utilização da MIF. Hospital das Clínicas. Faculdade de Medicina da Universidade de São Paulo;2005.
17. Martins A do N, Santana EF, Neves EG de C, *et al*. Sociodemographic and Clinical Profile of Patients with Spinal Cord Injury at a public hospital in Brazil. ARACÊ. 2025;7(2):5885-5905. doi:10.56238/arev7n2-081.
18. Martins A do N, Santana ÉF, Lopes KS, *et al*. Farmacoterapia de reabilitação e o impacto da vulnerabilidade social no acesso a medicamentos. Revista Eletrônica Acervo Saúde. 2025;25:e19777. doi:10.25248/reas.e19777.2025.
19. Kim S, Lee H, Park J, *et al*. Global and regional prevalence of polypharmacy and related factors, 1997-2022: An umbrella review. Arch Gerontol Geriatr. 2024;124:105465. doi:10.1016/j.archger.2024.105465
20. Shin WY, Go TH, Kang DR, *et al*. Patterns of patients with polypharmacy in adult population from Korea. Sci Rep. 2022;12(1):18073. doi:10.1038/s41598-022-23032-z
21. Dietz N, Alkin V, Agarwal N, *et al*. Polypharmacy in spinal cord injury: Matched cohort analysis comparing drug classes, medical complications, and healthcare utilization metrics with 24-month follow-up. J Spinal Cord Med. 2024 [Ahead of print]. doi:10.1080/10790268.2024.2375892
22. Bergen D. Neurological disorders: Public health challenges. JAMA Neurol. Neurol. 2008;65(1):154. doi:10.1001/archneurol.2007.19.
23. Ladbrook E, Bouchoucha S, Hutchinson A. Frequency and Characteristics of Medical Complications in Rehabilitation Settings: A Scoping Review. J Rehabil Med. 2022;54:jrm00350. doi:10.2340/jrm.v54.2752
24. Kitzman P, Cecil D, Kolpek JH. The risks of polypharmacy following spinal cord injury. J Spinal Cord Med. 2017;40(2):147-153. doi: 10.1179/2045772314Y.0000000235
25. Fabbietti P, Ruggiero C, Sganga F, *et al*. Effects of hyperpolypharmacy and potentially inappropriate medications (PIMs) on functional decline in older patients discharged from acute care hospitals. Arch Gerontol Geriatr. 2018;77:158-162. doi:10.1016/j.archger.2018.05.007
26. Matsumoto A, Yoshimura Y, Nagano F, *et al*. Polypharmacy and potentially inappropriate medications in stroke rehabilitation: prevalence and association with outcomes. Int J Clin Pharm. 2022;44(3):749-761. doi:10.1007/s11096-022-01416-5

27. Leite IM de O, Barbosa GGG, Leite LRF, *et al*. Quais condições se associam à polifarmácia em uma população geriátrica? Revista Brasileira de Geriatria e Gerontologia. 2024;27. doi:10.1590/1981-22562024027.230242.pt.

28. Navarrete-Villanueva D, Gesteiro E, Gómez-Cabello A, *et al*. Fat-Fit Patterns, Drug Consumption, and Polypharmacy in Older Adults: The EXERNET Multi-Center Study. Nutrients. 2021;13(8):2872. doi:10.3390/nu13082872

29. Silveira EA, Dalastra L, Pagotto V. Polypharmacy, chronic diseases and nutritional markers in community-dwelling older. Rev Bras Epidemiol. 2014;17(4):818-829. doi:10.1590/1809-4503201400040002

30. Feigin VL, Vos T, Nichols E, *et al*. The global burden of neurological disorders: translating evidence into policy. Lancet Neurol. 2020;19(3):255-265. doi:10.1016/S1474-4422(19)30411-9

31. Hanaoka S, Iwabuchi K, Hirai T, Seki T, Hayashi H. Effect of Increasing or Decreasing Use of Polypharmacy on Recovery of Activities of Daily Living in Patients With Stroke in the Recovery-Phase Rehabilitation Ward: A Retrospective Cohort Study Using Propensity Score Matching. Stroke Res Treat. 2024;2024:2381790. doi:10.1155/srat/2381790

32. Mesaque MA, Recalde DVG, Anes DJC, *et al*. Mortalidade masculina por causas externas em três agregados ecológicos (Brasil, Mato Grosso do Sul e Campo Grande), 2010 a 2019: implicações de classe, raça e gênero no perfil epidemiológico e suas tendências. Saúde e Pesquisa. 2024;17(1):e11403. doi:10.17765/2176-9206.2024v17n1.e11403.

33. Silva SK de A, Lima BL de, Barbosa DAM, *et al*. Óbitos por causas externas no Brasil: um estudo ecológico temporal de 2014 a 2018. Brazilian Journal of Development. 2021;7(7):67049-67059. doi:10.34117/bjdv7n7-128.

34. Tomasiello DB, Bazzo J, Parga J, *et al*. TD 2832 - Desigualdades raciais e de renda no acesso à saúde nas cidades brasileiras. 2023:1-38. doi:10.38116/td2832.

35. Maas F, Moser GAS, Goettens DA, *et al*. Characterization of traumatic spinal cord injuries: an integrative review of the literature. Scientific Electronic Archives. 2020;13(5):90. DOI:10.36560/1352020936.

36. Paiva VC, Nunes CV, Antonialli CV, *et al*. Epidemiology of post-traumatic spinal cord injury in a tertiary hospital. Acta Ortop Bras. 2023;31(5):e264492. doi:10.1590/1413-785220233105e264492

37. Paulo GML de, Colares CMP, Margarida MCA, *et al*. Trauma: característica sociodemográficas das vítimas e aspectos clínicos-assistenciais de sua ocorrência em hospital de urgência. Revista Eletrônica Acervo Saúde. 2021;13(10):e8683. doi:10.25248/reas.e8683.2021.

38. World Health Organization. Falls. April 26, 2021. Available in: https://www.who.int/news-room/fact-sheets/detail/falls. Accessed on: 29th Dec 2024.

39. Oliveira TS, Pereira AMM. Expressions of inequalities in access to health services in Latin America: a scoping review. Expressões das desigualdades no acesso aos serviços de saúde na América Latina: uma revisão de escopo. Cien Saude Colet. 2024;29(7):e04932024. doi:10.1590/1413-81232024297.04932024

40. Prokopidis K, Giannos P, Reginster JY, *et al*. Sarcopenia is associated with a greater risk of polypharmacy and number of medications: a systematic review and meta-analysis. J Cachexia Sarcopenia Muscle. 2023;14(2):671-683. doi:10.1002/jcsm.13190

41. Pana A, Sourtzi P, Kalokairinou A, Velonaki VS. Sarcopenia and polypharmacy among older adults: A scoping review of the literature. Arch Gerontol Geriatr. 2022;98:104520. doi:10.1016/j.archger.2021.104520

42. Matsumoto A, Yoshimura Y, Shimazu S, *et al*. Association of polypharmacy at hospital discharge with nutritional intake, muscle strength, and activities of daily living among older patients undergoing convalescent rehabilitation after stroke. Jpn J Compr Rehabil Sci. 2022;13:41-48. doi:10.11336/jjcrs.13.41