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TRENDS IN HOSPITAL HOSPITAL STAY DUE TO HYPERTENSION IN THE ELDERLY IN THE STATE OF PIAUÍ, 2010-2019

Tendência de internações e permanência hospitalar por hipertensão arterial em idosos no estado do Piauí, 2010-2019

Tendencias de la estancia hospitalaria por hipertensión en el anciano del estado de Piauí, 2010-2019

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ABSTRACT

Objective: to analyze the trend of hospitalizations and hospital stays due to arterial hypertension in the elderly in Piauí, from 2010 to 2019. **Methods:** an ecological, time-series study, using data on hospitalizations due to arterial hypertension in the elderly in Piauí, recorded in the Hospital Information System of the Unified Health System, from 2010 to 2019. For the analysis of trends, the Prais-Winsten linear regression method was used. **Results:** a decreasing trend was observed in the hospitalization rate for arterial hypertension. The average hospital stay rate showed an increasing trend for females and for the semiarid health macro-regions and Coastal. **Conclusion:** the study points to the need for investments in the continuity of the planning of actions that prevent the disease and promote the health of the elderly in primary care.

DESCRIPTORS: Health of the elderly; Hospital assistance; Time series studies; Epidemiology.

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RESUMO

Objetivo: analisar a tendência de internações e permanência hospitalar por hipertensão arterial em idosos no Piauí, 2010 a 2019. **Métodos:** estudo ecológico, de série temporal, utilizando dados de internações por hipertensão arterial em idosos no Piauí registradas no Sistema de Informações Hospitalares do Sistema Único de Saúde, no período de 2010 a 2019. Para análise das tendências utilizou-se o método de regressão linear de Prais-Winsten. **Resultados:** observou-se tendência decrescente na taxa de internação por hipertensão arterial. A taxa média de permanência hospitalar apresentou tendência crescente para sexo feminino e para as macrorregiões de saúde Semiárido e Litoral. **Conclusão:** o estudo aponta a necessidade de investimentos na continuidade do planejamento de ações que previnam a doença e promovam a saúde da pessoa idosa na atenção primária.

DESCRITORES: Saúde do idoso; Assistência hospitalar; Estudos de séries temporais; Epidemiologia.

RESUMEN

Objetivos: analizar la tendencia de hospitalizaciones y estancias hospitalarias por hipertensión arterial en ancianos en Piauí, de 2010 a 2019. **Métodos:** estudio ecológico, de serie temporal, utilizando datos de hospitalizaciones por hipertensión arterial en ancianos en Piauí, registrado en el Sistema de Información Hospitalaria del Sistema Único de Salud, de 2010 a 2019. Para el análisis de tendencias, se utilizó el método de regresión lineal de Prais-Winsten. **Resultados:** se observó una tendencia decreciente en la tasa de hospitalización por hipertensión arterial. La tasa de estancia hospitalaria promedio mostró una tendencia creciente para el sexo femenino y para las macrorregiones sanitarias Semiárida y Costa. **Conclusión:** el estudio apunta para la necesidad de inversiones en la continuidad de la planificación de acciones que previenen la enfermedad y promueven la salud de los ancianos en la atención primaria.

DESCRIPTORES: Salud de los ancianos; Atención hospitalaria; Estudios de series de tiempo; Epidemiología.

INTRODUCTION

Chronic non-communicable diseases (NCDs), including cardiovascular disease (CVD), cancer, diabetes and chronic lung disease, are responsible for almost 70% of all deaths worldwide and remain on the rise, being higher in low-income countries. In 2022, there were 4.5 million deaths worldwide, 60% of which were due to NCDs, with CVDs accounting for approximately 75% of public health expenditure.[1-2]

In Brazil, Arterial Hypertension (AH) is characterized as an important collective health problem, due to its high prevalence, morbidity and mortality, low rate of adequate control, high economic costs and complications arising from the disease, representing one of the main reasons for hospitalizations among the elderly in the country. Its prevalence reaches more than 50% for individuals aged 60 to 69 years and 75% in individuals over 70 years of age.[3]

Hospital stay can directly influence the decrease in the autonomy of older adults and their quality of life. Research reveals a close connection between hospitalized older adults and situations of frailty, restriction of the ability to exercise autonomy and subsequent cognitive deterioration. One way of prevention would be to opt for hospitalization only when the resources of other levels of health care have been fully exhausted.[3-4]

Research on AH in the elderly generally permeates issues related to improvements in quality of life, adherence to treatment, reduction of avoidable hospitalizations and costs to the public system.[5] Some studies on hospitalizations with the elderly in the state of Piauí have been published, however, the themes are related to other NCDs such as diabetes and acute myocardial infarction.

Thus, the monitoring of hospitalizations due to AH is a relevant topic for the health care of the elderly, since the dimensioning of hospitalizations due to the disease is fundamental to subsidize the elaboration of public policies and guide the construction of strategies for prevention and health promotion related to this cause. Thus, the study aims to analyze the trend of hospitalizations and hospital stay due to AH in the elderly in Piauí, 2010 to 2019.

METHODS

Ecological time series study on hospitalizations for AH, from 2010 to 2019. The records of hospitalizations and mean hospital stays were obtained through the Hospital Information System of the Unified Health System (SIH/SUS), available on the website of the Department of Informatics of SUS (DATASUS). Estimates of the elderly population living in the state were obtained from the Brazilian Institute of Geography and Statistics (IBGE).

Data were collected according to the following variables: gender (female and male); age group (60 to 69 years, 70 to 79 years and 80 years and over); color/race (white, black (black plus brown) and others (yellow plus indigenous)); and health macro-region (Semi-arid, Mid-North, Coast and Cerrados). The International Classification of Disease - 10th revision (ICD10) was used to define the AH code. The main diagnosis was I10, essential hypertension (primary).

To calculate the hospitalization rate, the number of hospitalizations for AH in the elderly was divided by the number of elderly residents in Piauí and the result was multiplied by 100,000 inhabitants. The average hospital stay was calculated by adding the days of hospitalization of each patient in the period by the number of patients in the same period. The hospitalization rate and average length of stay were calculated by sex, age group, color/race, health macro-region for each year of the study.

The Prais-Winsten linear regression model was used to analyze temporal trends in hospitalization and length of stay rates, through which it was possible to obtain the annual percentage change (APC) and respective 95% confidence intervals (95%CI) using the R program, version 4.2.0. As described by Antunes and Cardoso[6], for each state, region and for the country, a model of the type:

$$log(y_t)=\beta_0+\beta_1 x_t+\varepsilon_t$$

Where y_t is the crude detection rate in year t, x_t represents the year in which the detection rate occurs and is the error at time t. Instead of using crude detection rate directly, we chose to model the logarithm of the rate.[6]

Once the model was adjusted, for each state, region and for the country, the estimate of β_1 was obtained as well as its 95% confidence interval. After that, the APV was obtained using the following formula:

$$VPA=(10^\beta-1)\times100$$

The 95% confidence interval of APV was obtained by the same formula, only replacing β_1 by the respective lower and upper limits of the 95% interval. Trends in hospitalization rates were interpreted as increasing (p < 0.05 and positive regression coefficient), decreasing (p < 0.05 and negative regression coefficient) and stable (p > 0.05). Statistical significance was attested when p < 0.05.[6]

This study does not require approval by the Research Ethics Committee, in compliance with the ethical principles of Resolution 466/2012 of the National Health Council, since the data used were accessed in secondary databases and in the public domain, without identifying the patients.

RESULTS

There were 6,822 hospitalizations for AH in the elderly in the state of Piauí between 2010 and 2019. There was a predominance of female patients (58.0%), black color/race (87.6%), aged between 60 and 69 years (38.6%) and in the Semi-arid health macro-region (31.7%) (Table 1).

The hospitalization rate for AH showed a downward trend over the historical series, with APV of -23.9% (95%CI: -31.5; -15.4). There was a greater reduction in hospitalizations of male patients (APC: -24.4%; 95%CI: -32.1;-15.8), white color (APC: -39.5; 95%CI: -53.2;-21.8) and age group of 80 years and over (APC: -18.4; 95%CI: -30.6;-4.1). The Meio-Norte health macro-region was the one that decreased the most (APV: -35.5; 95%CI: -41.5;-29) and the Litoral was the only one that remained stable (APV: 6.3; 95%CI: -28;56.8) (Table 2).

The mean hospital stay was the same for both sexes (3 days). The highest means were observed among older adults aged 80 years and over (3.2 days), black color/race (5.7 days) and residents of the Litoral health macro-region (3.7 days) (Table 3).

The trend of the mean hospital stay rate for AH was increasing only in females (APV: 9%; 95%CI: 3.1; 15.2) and in the Semi-arid

(APV: 203.3; 95%CI: 123.9; 310.9) and Litoral (APV:237; 95%CI: 83.8; 517.7) health macro-regions (Table 4).

Table 1 - Hospitalizations for essential (primary) arterial hypertension according to sex, age group, color/race and health macro-region in the State of Piauí, 2010-2019. Teresina, Piauí - 2022.

Variables	Hospitalization				Total	
	2010		2019		n	%
	n	%	n	%		
Total	1.159		491		6.822	
Gender						
Male	490	42,3%	203	41,3%	2.868	42,0%
Female	669	57,7%	288	58,7%	3.954	58,0%
Skin color						
White	119	10,3%	23	4,7%	499	7,3%
Black[a]	1.039	89,6%	417	84,9%	5.978	87,6%
Other[b]	1	0,1%	51	10,4%	343	5,0%
Age Group						
60 to 69 years	472	40,7%	163	33,2%	2.630	38,6%
70 to 79 years	424	36,6%	179	36,5%	2.501	36,7%
80 years and over	263	22,7%	149	30,3%	1.691	24,8%
Health macro-region						
Semi-arid	397	34,3%	121	24,6%	2.161	31,7%
Mid-North	380	32,8%	85	17,3%	2.038	29,9%
Coast	107	9,2%	153	31,2%	875	12,8%
Cerrados	270	23,3%	135	27,5%	1.732	25,4%

[a]Black plus Brown; [b]Yellow plus Indigenous.
Source: Ministry of Health. Hospital Information System of the SUS-SIH/ SUS.

Table 2 - Trends in the rate of hospitalizations for essential (primary) arterial hypertension, according to sex, age group, color/race and health macro-region in the state of Piauí, 2010-2019. Teresina, Piauí - 2022.

Variables	Hospitalization rate		APC[c]	CI95%[d]	p-value	Trends
	2010	2019				
Total	344,4	119,4	-23,9	-31,5;-15,4	< 0,001	Decrescente
Gender						
Male	145,6	49,3	-24,4	-32,1;-15,8	< 0,001	Decrescente
Female	198,8	70,0	-23,7	-31,6;-14,9	< 0,001	Decrescente
Age group						
60 to 69 years old	140,2	39,6	-27,6	-34,2;-20,4	< 0,001	Decrescente
70 to 79 years old	126,0	43,5	-24,0	-30,0;-17,5	< 0,001	Decrescente
80 years and over	78,1	36,2	-18,4	-30,6;-4,1	0,039	Decrescente
Skin color						
White	35,4	5,6	-39,5	-53,2;-21,8	< 0,001	Decrescente
Black[a]	308,7	101,4	-25,4	-32,8;-17,2	< 0,001	Decrescente
Other[b]*	0,3	12,4				
Health macro-region						
Semi-arid	118,0	29,4	-30,4	-36,9;-23,3	< 0,01	Decrescente
Mid-North	112,9	20,7	-35,5	-41,5;-29	< 0,01	Decrescente
Coast	31,8	37,2	6,3	-28;56,8	0,766	Estacionária
Cerrados	80,2	32,8	-18,5	-24,3;-12,2	< 0,001	Decrescente

[a]Black plus Brown; [b]Yellow plus Indigenous; [c]APC: Annual percentage change; [d]CI: Confidence interval; *It was not possible to calculate Prais-Winsten because the original value was insufficient to transform it into a logarithm.
Source: Ministry of Health. Hospital Information System of the SUS-SIH/ SUS.

Table 3 - Average hospital stay for essential (primary) hypertension in older adults in the state of Piauí, 2010-2019. Teresina, Piauí - 2022.

Variables	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
Total	3,0	2,9	2,8	2,6	2,6	2,9	3,1	3,2	3,3	3,8	3,0
Gender											
Male	3,2	3,0	2,9	2,6	2,6	2,9	3,0	2,9	3,3	3,7	3,0
Female	2,8	2,9	2,8	2,7	2,6	3,0	3,1	3,4	3,4	4,0	3,0
Age group											
60 to 69 years old	2,9	2,8	2,8	2,5	2,5	2,8	3,1	3,1	3,2	3,6	2,9
70 a 79 years old	3,1	2,8	2,9	2,8	2,6	2,7	3,0	3,5	3,5	3,9	3,0
80 years and over	3,0	3,3	2,9	2,5	2,8	3,5	3,1	3,1	3,2	4,2	3,2
Skin color											

White	2,2	2,1	2,2	2,2	1,9	2,0	2,5	2,4	2,7	2,6	2,2
Black	6,6	5,8	5,1	4,1	7,6	5,2	5,4	6,2	6,0	6,4	5,7
Other	4,0	3,5	3,0	0,0	0,0	2,1	2,5	3,0	2,9	2,9	2,8
Health macro-region											
Semi-arid	2,3	2,4	2,3	2,2	2,2	2,9	3,0	3,1	3,5	3,1	2,6
Mid-North	4,0	3,7	3,7	3,0	3,1	4,1	3,6	3,2	3,3	3,3	3,6
Coast	2,9	2,8	3,0	3,5	3,0	2,9	3,4	3,9	4,0	5,7	3,7
Cerrados	2,6	2,5	2,6	2,5	2,3	2,1	2,4	2,8	2,6	2,7	2,5

Source: Ministry of Health. Hospital Information System of the SUS-SIH/ SUS.

Table 4 - Trend of the average hospital stay for essential (primary) hypertension in older adults in the state of Piauí, 2010-2019. Teresina, Piauí - 2022.

Variables	Average length of stay		APV[c]	CI95%[d]	p-value	Trends
	2010	2019				
Total	3,0	3,8	-23,9	-31,5;-15,4	< 0,001	Decrescente
Gender						
Male	3,2	3,7	3,7	-3,9;11,9	0,377	Estacionária
Female	2,8	4,0	9,0	3,1;15,2	< 0,001	Crescente
Age group						
60 to 69 years old	2,9	3,6	5,8	-0,5;12,6	0,112	Estacionária
70 to 79 years old	3,1	3,9	6,4	-1,3;14,7	0,146	Estacionária
80 years and over	3,0	4,2	6,0	-0,9;13,5	0,129	Estacionária
Skin color						
White	2,2	2,6	5,7	0,2;11,4	0,077	Estacionária
Black[a]	6,6	6,4	2,4	-4,2;9,5	< 0,001	Estacionária
Other[b]*	4,0	2,9				
Health macro-region						
Semi-arid	2,3	3,1	203,3	123,9;310,9	< 0,001	Crescente
Mid-North	4,0	3,3	6,9	-37,6;83,1	0,816	Estacionária
Coast	2,9	5,7	237	83,8;517,7	< 0,001	Crescente
Cerrados	2,6	2,7	32,4	3,7;69	0,055	Estacionária

[a]Black plus Brown; [b]Yellow plus Indigenous; [c]APC: Annual percentage change; [d]CI: Confidence interval; *It was not possible to calculate Prais-Winsten because the original value was insufficient to transform it into a logarithm.
Source: Ministry of Health. Hospital Information System of the SUS-SIH/ SUS.

DISCUSSION

In the period from 2010 to 2019, in the state of Piauí, there was a reduction in the absolute number and a decreasing trend in the hospitalization rate for essential AH in the elderly. On the other hand, the average hospital stay rate showed an increasing trend for females and in the Semiárido and Litoral health macro-regions.

The reduction in the number of hospitalizations over time is similar to that of studies developed in Brazil. A study that analyzed causes of hospital admissions in the elderly in Brazil found a reduction in hospitalizations for AH throughout the country, with emphasis on the Northeast region.[7]

This decrease in hospitalizations for AH in Piauí may reflect better access to Primary Health Care (PHC) health services and timely and effective treatment. The expansion of treatment and assistance, as well as improved care with prevention and health promotion aimed at the population diagnosed with AH, leads to a consequent reduction in hospitalizations, as pointed out in the study by Walker et al.[8] who found that with the increase in the population monitored and treated by PHC, the number of hospitalizations for AH decreased over time.

As it is a sensitive condition in primary care, blood pressure monitoring, adherence to treatment, healthy behaviors and financial incentives for municipalities to invest in hypertensive follow-up programs in PHC are relevant in the treatment of AH and in the quality of life, positively influencing the reduction of hospitalizations for AH.[3,9]

The female gender registered more frequent hospitalizations, corroborating the study carried out in elderly residents in the municipality of Barreiras/BA[10], and that observed in the National Health Survey (PNS) of 2013.[11] Women are more aware of their health and thus seek health services more regularly, in addition to being more concerned about controlling blood pressure (BP) levels and greater adherence to antihypertensive treatment when compared to men.[12]

The age group adds important information regarding the population profile and factors that influence hospitalization occurrences. The results obtained indicate a higher number of hospitalizations in the age group of 60 to 69 years. There is a direct association between high age and AH, due to the deleterious effect of the disease on the body in which advancing age influences blood pressure levels, remaining high mainly above 65 years of age.[13,14]

The black color/race was more prevalent in hospitalizations, supporting the data found in the study by Will et al.[15] who highlighted a higher prevalence in the black color. This data may be due to socioeconomic and geographical barriers, inadequate care and the presence of comorbidities. The absence of race/color information in 5% of hospitalizations for AH is noteworthy, which compromises planning and resource allocation for actions aimed at the real need.

When showing the behavior of the trend of hospitalization rates due to AH and Family Health Strategy (FHS) coverage in Brazil from 2010 to 2019, De Oliveira et al.[16] observed that Piauí had the highest hospitalization rate among Brazilian states in 2010 (192.9/100,000 inhabitants) and showed the greatest reduction (-69.6%) in the period studied, ending the historical series with a rate of 58.5/100,000 inhabitants. These data ratify values found in the present study, which observed a decreasing trend for the hospitalization rate due to AH in the elderly in Piauí.

On the other hand, the trend of the average hospital stay rate was increasing in females and in two health macro-regions (Semiarid and Coastal), in which limited access to health services, socioeconomic barriers, lifestyle and risk factors, climatic and environmental conditions, among others, may be significant predictors for these results. Such findings are corroborated by the study of Dantas et al.[17] when performing the analysis of hospitalizations for essential AH of elderly Brazilians, from 2010 to 2015. It was found that in the Northeast region the average hospital stay (4.2 days) of patients with AH decreased, with females having the highest average hospital stay. The average length of hospital stay defines the severity of the case, the adequacy of the service to assist and the costs with procedures, being an important indicator to be considered in the planning of assistance.

The length of hospital stay increases with age, and the older the patient, the more susceptible they are to clinical problems when compared to other age groups. Despite the improvement and progress in the treatment of AH and cardiovascular diseases in general, studies indicate that the time and number of hospitalizations and the amount of hospital expenses with the disease are still high. This finding is due to the exposure of patients with this condition to inadequate therapy, lack of adherence to treatment, social isolation, or worsening of cardiac function, factors that are associated with decompensation of the disease. In elderly patients with AH, in addition to higher hospital costs in the decompensation phase, it is possible to observe that individuals remain for more days in the hospital unit, or are readmitted more often.[18]

These findings demonstrate that in addition to generating a strong budgetary impact for the health system, hospitalizations of elderly patients also have direct consequences for the health of the individual himself, and negatively impact both his functionality and quality of life, as well as that of his caregivers.[18] As an alternative, for a direct reduction of negative impacts, it is the expansion of home care programs with stimulus to self-care, and the identification of needs after discharge to provide means of access to supports that will be needed, thus avoiding hospital readmissions in a short period of time.

In addition, continued investments are needed, especially in PHC, to qualify hypertensive care and preventive care, such as the availability of more qualified professionals for assistance in interdisciplinary care, medicines, specialized

consultations, and the development of educational strategies that position hypertensive adults and older adults as providers of their care actions. It is essential to recognize them as autonomous subjects and knowledgeable of their limitations and potentialities, improving their quality of life and, consequently, reducing hospitalization expenses. This access to care and assistance through PHC may justify the results found in this study, which show a decrease in hospitalizations between 2010 and 2019.

Knowing the profile of hospitalizations and hospital stays of the elderly population due to AH can provide elements for a better planning of public policies for this age group, with a view to healthy aging and quality of life.[x] Therefore, there is a need for detailed analyzes of the health situation of the Brazilian elderly population, especially hypertensive, which foster prevention and health promotion actions, as well as subsidize the development of public health policies.

This study has some limitations. The research data were obtained from SIH/SUS, which includes all public hospital care, as well as care provided in the private network that is reimbursed by the Unified Health System (SUS), but excludes the portion of the population covered by health plans. In addition, the use of secondary data may present inconsistencies such as possible underreporting and coding errors presented by the databases used.

CONCLUSION

The study identified a downward trend in hospitalization rates and the average hospital stay rate for essential (primary) AH in the elderly in Piauí, from 2010 to 2019. It is expected that the results obtained in this study will contribute to the planning of actions that prevent AH and promote the health of the elderly, since AH causes repercussions on quality of life, autonomy and independence in addition to generating high economic and social costs. Therefore, other future investigations, especially outside the hospital environment, should be carried out to better assess the magnitude of the impact of AH.

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