

Prevalence and factors associated with multimorbidities in Brazilian older adults

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Abstract *This study aimed to identify the prevalence of multimorbidity in Brazilian older adults and factors associated with socioeconomic and lifestyle variables. This is a cross-sectional, population-based study carried out with data from the National Health Survey database. Seniors with multimorbidity were the ones with a diagnosis of two or more chronic diseases. The chi-square test was used in data analysis, and then prevalence ratios were estimated through Poisson multiple regression, both with 95% confidence level. In total, 11,697 older adults were evaluated and the multimorbidity prevalence was 53.1%. As a result of the multivariate analysis, female seniors ($p < 0.001$), the oldest elderly ($p = 0.002$), those who were not single, more strongly associated with widowers ($p = 0.001$) and those with a health plan at the interview ($p < 0.001$) were associated with multimorbidity. Also, in comparison with older adults with two chronic diseases, women are associated with three ($p = 0.003$) and four or more chronic diseases ($p < 0.001$). We can conclude that multimorbidity in Brazilian older adults is a widespread condition and that it has been influenced by socioeconomic factors and is poorly related to lifestyle.*

Key words *Multimorbidity, Older adults, Associated factors*

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Introduction

The occurrence of multiple chronic diseases is a fairly common condition in health. Such a situation is probably due to the reduced diagnostic threshold for some chronic diseases, population aging or possibly the increased prevalence of these diseases¹. Also, when it comes to the elderly population, the occurrence of different health problems in the same individual, also known as multimorbidity, appears as an even more frequent problem. This may be closely related to the increased life expectancy of the population².

Concerning the concept of multimorbidity, although well-established in literature, the definition of the number of chronic conditions in the same individual varies considerably. Among these variations are studies that consider multimorbidity as the involvement of two or more chronic diseases and others as the presence of at least three³. Thus, multimorbidity prevalence estimates in older adults also vary. According to literature, the prevalence of multiple chronic diseases ranges from 30.7% to 57%⁴⁻¹⁰.

Given its prevalence, severity and impact on the quality of life, multimorbidity is currently considered a public health problem¹¹. With a percentage that can exceed 50%, the prevalence of this condition in the elderly is high, and trend studies predict that this figure will increase further¹²⁻¹⁵. The presence of multimorbidity in the elderly can lead to severe losses, including more significant risks of death and functional decline, as well as reducing the life expectancy of this population segment^{16,17}. While it can be controlled through treatments and lifestyle changes, the proper management of a patient with multimorbidity is a challenge for health services at different levels of complexity. Also, identifying the factors associated with the prevalence of this condition can help this management adequately^{12,18}.

Thus, the identification of these associated factors facilitates the formulation of public policies aimed at the prevention of these diseases and the elaboration of strategies in the areas of promotion, surveillance and health care¹⁹. Besides this relevance, it is necessary to carry out studies of greater population coverage that evaluate the factors associated with multimorbidity in older adults, since the authors who proposed to study this subject did so with small populations^{5,6,8-10}. In this context, this study aimed to identify the prevalence of multimorbidity in Brazilian older adults and its associated factors. Also, the search

for associated factors was also performed comparing the presence of three and four or more chronic diseases with seniors who had two chronic diseases.

Methods

This is a cross-sectional, population-based study. It was conducted from the National Health Survey (PNS) database, with data collected in 2013 and 2014. The PNS is representative for residents aged 18 and over, living in the country's private households in urban areas covering the five geographic macro-regions. However, this study's unit of analysis was only seniors (11,697 individuals), with age equal to or greater than 60 years. The PNS research project was approved by the National Research Ethics Commission.

The older adults with a multimorbidity condition should have had a diagnosis of two or more chronic diseases to estimate the prevalence of multimorbidity. The chronic diseases considered were those studied in the PNS, such as hypertension, diabetes, high cholesterol, heart disease, stroke, asthma, arthritis or rheumatism, spinal problems, depression, mental diseases (schizophrenia, bipolar disorder or obsessive-compulsive disorder), lung diseases (chronic bronchitis, emphysema or chronic obstructive pulmonary disease), cancer and kidney failure. For all the above mentioned chronic diseases, their identifications were provided from the question "has any doctor ever given you the diagnosis for this disease?"

Two blocks of variables were analyzed regarding the factors associated with the occurrence of multimorbidity in seniors. The first was represented by socioeconomic variables (gender, age, skin color or ethnicity, marital status, schooling and health plan) and the second by lifestyle variables (alcohol and tobacco use and physical activity). Besides verifying the association of these variables with the presence of two or more chronic diseases, the association of these variables was also made by comparing the presence of two and three chronic diseases and two and four chronic diseases.

Statistical Package for Social Science (SPSS) 20.0 was used to analyze the data. Initially, the frequency distribution of all variables of the study was performed to prepare the tables. Finally, the chi-square test was employed with a confidence level of 95% to verify the association between sociodemographic and lifestyle vari-

ables with the presence of multimorbidity in older adults. Multicollinearity was tested through chi-square tests for the independent variables with $p < 0.200$, and because of the sample size, such associations were considered significant for a p -value = 0.000001. Next, the adjusted prevalence ratios were estimated using Poisson multiple regression. It should also be noted that the data were weighted considering the sampling plan effect, non-response rates and post-stratification weights.

Results

A total of 11,697 Brazilian elderly were evaluated, with a mean age of 70.1 years (± 0.1), ranging from 60 to 107 years. This study evidenced a predominance of female (60%), white older adults (54.7%), younger elderly (55 to 69 years, 55.2%), married (44.5%), incomplete primary school (38.4%), physically inactive (77.4%), without a health plan (68.3%), non-drinkers (73.6%) and non-smokers (84.7%). The prevalence of multimorbidity in the Brazilian seniors was 53.1%.

Table 1 shows the frequency of the independent variables and the association with the multimorbidity variable in the older adults in the univariate analysis. Based on the data presented, the prevalence of multimorbidity in seniors is associated with the females, older seniors, non-single (more strongly associated with widowers), low schooling, with a health plan and alcohol and tobacco non-user at the time the research. Again, in Table 1, the factors associated with the prevalence of multimorbidity in older adults were being females, older seniors, more strongly with the widowed marital status and with a health plan.

When comparing the older adults with two chronic diseases with those with three diseases (Table 2), the univariate analysis showed that the prevalence of three chronic diseases was associated with females, seniors with incomplete primary school, non-smokers and those not engaged in physical activities. In the multivariate analysis (Table 2), only the fact that seniors were female remained significant.

Finally, in Table 3, we compared the elderly who had two chronic diseases with those who had four or more. The univariate analysis showed a higher number of chronic diseases associated with female non-users of alcohol at the time of the interview. In this case, being a female remained significant after adjustment in the multivariate analysis.

Discussion

This study aimed to identify the prevalence of multimorbidity in older adults, seeking association with socioeconomic conditions and lifestyle. The results found are representative of the Brazilian senior population. Given its seriousness in public health and the impact on the quality of life of these older adults, identifying such prevalence and associated factors is of great value for the establishment of measures aimed at the prevention of these diseases¹⁹.

The prevalence of multimorbidity in older adults found in this study was 53.1%, similar to those found in other studies⁴⁻¹⁰. Considering the frequency of this condition in more than half of the Brazilian senior population, one can see how common it is. This number becomes even more alarming when it is verified that multimorbidity is associated with disability, greater needs for health care and spending⁵. Therefore, preventive measures that seek active and healthy aging become increasingly necessary. This high prevalence can be explained by the increased life expectancy of these older adults, which allows a higher probability of accumulations of chronic diseases in these individuals².

Being female was associated with a higher prevalence of multimorbidity in the elderly in the univariate and multivariate analyses. Also, women had more significant numbers of chronic diseases than men when multimorbidity was stratified into two, three or four or more chronic diseases. When comparing genders, these associations may be related to the fact that women have a longer life expectancy and worse health status compared to men. In turn, this implies a greater need for care to women's health in all life cycles, in order to have healthy aging present in this population segment⁴⁻¹⁰.

Besides the female gender, the fact that they were older, had a health plan and were not single – more strongly associated with widowers – was associated with multimorbidity in older adults, even after adjustment for other variables. Concerning age, this study corroborates the literature^{4,6,7,9}. Therefore, it is suggested that older seniors tend to have more multimorbidities⁶ because they suffer more acutely physiological aging. On the other hand, those with private health plans may have more access to medical visits, and consequently, it is easier for them to receive a diagnosis of the presence of chronic diseases. Another reason that may explain this association is the possibility that older adults have acquired

Table 1. Association between multimorbidity in older adults with socioeconomic and lifestyle variables, and their crude and adjusted prevalence ratio measures.

Variable	Category	Prevalence of multimorbidity		PR	95% CI	p	PR _{ADJ}	95% CI _{ADJ}	p*
		Presence of multimorbidity %	Absence of multimorbidity %						
Gender	Male	45.1	54.9	0.77	0.73-0.82	< 0.001	0.90	0.89-0.91	<0.001
	Female	58.3	41.7						
Age	60-69 years	50.8	49.2	1.00	-	0.001			0.001
	70-79 years	56.8	43.2	1.12	1.05-1.19		1.03	1.01-1.04	
	80 years or over	53.9	46.1	1.06	0.99-1.15		1.02	1.00-1.02	
Skin color or ethnicity	White	54.5	45.5	1.00	-	0.127			
	Black	52.9	47.1	0.97	0.89-1.06				
	Brown	50.8	49.2	0.93	0.88-0.99				
	Other	53.0	47.0	0.97	0.78-1.21				
Marital status	Single	44.5	55.5	1.00	-	<0.001	1.00	-	0.001
	Married	52.7	47.3	1.19	1.09-1.29		1.03	1.02-1.04	
	Separated/divorced	53.9	46.1	1.21	1.08-1.36		1.01	1.01-1.02	
Schooling	Widower	56.8	43.2	1.28	1.17-1.40		1.06	1.03-1.09	
	Illiterate	52.6	47.4	1.00		0.005			
	Primary school incomplete	55.2	44.8	1.05	0.99-1.12				
Health plan	Primary school complete or over	50.9	49.1	0.97	0.90-1.04				
	Yes	55.1	44.9	1.10	1.03-1.18	0.007	1.03	1.02-1.05	<0.001
Alcohol use	No	50.0	50.0						
	Yes	46.6	53.5	0.87	0.80-0.94	0.001			
Tobacco use	No	53.5	46.5						
	Yes	42.0	58.0	0.79	0.70-0.90	<0.001			
Physical activity	No	53.2	46.8						
	Yes	53.9	46.1	1.06	0.98-1.14	0.185			
	No	51.1	48.9						

*P-value adjusted from the Poisson multiple regression.

Table 2. Association between the presence of two or three chronic diseases in older adults with socioeconomic and lifestyle variables and their crude and adjusted prevalence ratio measures.

Variable	Category	Three chronic diseases		Two chronic diseases		PR	95% CI	P	PR _{adj}	95% CI _{adj}	p*
		%	%	%	%						
Gender	Male	35.0	65.0	0.85	0.74-0.97	0.014	0.97	0.95-0.99	0.003		
	Female	41.2	58.8								
Age	60-69 years	37.4	62.6	1.00	-	0.319					
	70-79 years	41.1	58.9	1.10	0.96-1.26						
Skin color or ethnicity	80 years or over	40.0	60.0	1.07	0.91-1.26						
	White	40.2	59.8	1.00	-	0.074	-		0.188		
	Black	31.5	68.5	0.78	0.64-0.96		0.82	0.81-0.83			
	Brown	39.6	60.4	0.98	0.87-1.11		0.78	0.76-0.79			
Marital status	Other	26.4	73.6	0.66	0.39-1.11		0.98	0.96-1.01			
	Single	36.1	63.9	1.00	-	0.322					
	Married	38.7	61.3	1.07	0.91-1.26						
	Separated/divorced	35.3	64.7	0.98	0.81-1.18						
Schooling	Widower	41.4	58.6	1.15	0.98-1.34						
	Illiterate	37.1	62.9	1.00	-	0.004					
	Primary school incomplete	43.6	56.4	1.18	1.04-1.33						
	Primary school complete or over	34.7	65.3	0.93	0.80-1.09						
Health plan	Yes	40.9	59.1	1.08	0.95-1.22	0.251					
	No	38.0	62.0								
Alcohol use	Yes	35.3	64.7	0.88	0.74-1.04	0.125					
	No	40.1	59.9								
Tobacco use	Yes	29.7	70.3	0.74	0.60-0.92	0.003	0.98	0.95-1.01	0.180		
	No	40.0	60.0								
Physical activity	Yes	34.1	65.9	0.84	0.72-0.98	0.020	0.99	0.97-1.01	0.536		
	No	40.6	59.4								

*P-value adjusted from the Poisson multiple regression.

Table 3. Association between the presence of two or four chronic diseases or over in older adults with socioeconomic and lifestyle variables and their crude and adjusted prevalence ratio measures.

Variable	Category	Four chronic diseases or over		Two chronic diseases		PR	95% CI	P	PR _{ADJ}	95% CI _{ADJ}	P*
		%	%	%	%						
Gender	Male	23.3	76.7	0.76	0.63-0.92	0.005	0.96	0.94-0.97	<0.001		
	Female	30.6	69.4								
Age	60-69 years	27.7	72.3	1.00	-	0.672					
	70-79 years	29.3	70.7	1.06	0.86-1.30						
	80 years or over	25.9	74.1	0.93	0.73-1.19						
Skin color or ethnicity	White	30.0	70.0	1.00	-	0.202					
	Black	23.5	76.5	0.78	0.60-1.03						
	Brown	26.3	73.7	0.88	0.72-1.06						
	Other	20.9	79.1	0.70	0.38-1.27						
Marital status	Single	23.8	76.2	1.00	-	0.327					
	Married	28.3	71.7	1.19	0.89-1.61						
	Separated/divorced	24.5	75.5	1.03	0.78-1.36						
	Widower	30.0	70.0	1.26	0.99-1.61						
	Illiterate	24.3	75.7	1.00	-	0.104	1.00	-	0.105		
Schooling	Primary school incomplete	30.2	69.2	1.24	1.04-1.48		0.90	0.88-0.92			
	Primary school complete or over	29.0	71.0	1.19	0.97-1.46		0.79	0.78-0.79			
Health plan	Yes	30.0	70.0	1.12	0.93-1.34	0.247					
	No	26.9	73.1								
Alcohol use	Yes	22.9	77.1	0.78	0.60-1.00	0.042					
	No	29.5	70.5								
Tobacco use	Yes	19.6	80.4	0.68	0.44-1.03	0.054	0.98	0.95-1.00	0.107		
	No	28.9	71.1								
Physical activity	Yes	26.7	73.3	0.94	0.77-1.15	0.558					
	No	28.4	71.6								

*P-value adjusted from the Poisson multiple regression.

private health plans after the diagnosis of chronic diseases in a health service. Because this is a cross-sectional study, there is no way of identifying what came first, multimorbidity or the acquisition of private health plans.

Concerning the association with those non-single seniors, it is understood that married, separated and specifically widowed older adults who had a more significant association may suffer more frequent abuse. When separating from the spouse or being widowed, seniors tend to return to their relatives' homes and may suffer abandonment, emotional abuse, financial or material exploitation, neglect, and physical abuse. Such abuse, coupled with the physiological aging, may lead to a higher probability of accumulating chronic diseases²⁰. The same is true for married older adults, who are housed in a home with spouses and a community, with the possibility of being abused.

Other factors were shown to be associated with multimorbidity in older adults within only univariate analysis, namely: lower levels of schooling and the fact that they did not use alcohol and tobacco at the time of the interview. Regarding the educational level, the literature on the subject corroborates the results of this study^{5,9}. Worse off educational levels undermine the individual search for knowledge and consequently access to more information on health promotion towards adopting healthy lifestyles, not preventing the accumulation of chronic diseases⁵.

Regarding lifestyle, the results of this study differ from those published in the literature^{4,6}. However, the results found here in the univariate analysis follow a logic, since older adults with more multimorbidities in Brazil are more associated with those with private health plans, and consequently tend to have more access to medical guidance. Given these guidelines, possibly the recommendations of not smoking and not using alcohol should be present since alcohol and tobacco are among the five most relevant risk factors for the onset and deterioration of chronic diseases²¹. Following the same rationale, this possible justification extends to the fact that seniors with a more significant number of chronic diseases are associated in the univariate analysis to the habit of not smoking and not consuming alcoholic beverages at the time of the research.

A differential mark of this study the evaluation of the association between physical activity and multimorbidity in older adults. Studies

published in the literature that sought lifestyles associated with multimorbidity in the elderly did not evaluate the variable physical activity^{4,6}. The results of this study revealed a low influence of this variable for both the prevalence of multimorbidity and a more considerable amount of chronic diseases found. This result should probably be related to the characteristic of the seniors evaluated, in which more than 70% do not perform physical activities. When comparing the presence of two and three diseases, only the univariate analysis evidenced that a more significant number of diseases became more present in older adults who did not perform physical activities. It is already agreed in the literature that physical inactivity is associated with a higher prevalence of falls, physical weakness, mood swings and obesity²². Thus, the increased number of chronic diseases accumulated in the Brazilian seniors may be correlated with the consequences of the lack of these daily physical exercises, since they increase the incidence of diabetes and osteoporosis, for example.

It is worth mentioning that longitudinal studies on the subject are required given some contradictory results with previous studies in the literature, especially with those related to the variables "alcohol and tobacco use". Because this is a cross-sectional study, it hinders the possibility of identifying a well-established causal relationship, and therefore only hypotheses can be inferred. This study is characterized by a large population range and inference to the profile of the Brazilian older adults with multimorbidity. Thus, greater attention to preventive measures and incentive for healthy aging should be provided to the elderly female, older seniors, the widowed, separated or married, with low schooling level and physically inactive.

Conclusion

In conclusion, the results show that multimorbidity in Brazilian older adults is a widespread condition. It has been influenced by socioeconomic factors and is poorly related to lifestyle. Being female, older, having a low educational level and being widowed, separated or married were associated with the prevalence of multimorbidity in Brazilian seniors. Also, women are more associated with having a more significant number of chronic diseases.

Collaborations

LA Melo worked on the collection and interpretation of data, on the design and final writing of the manuscript. KC Lima worked on the orientation of the study, data analysis, critical analysis and writing of the manuscript.

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Article submitted 26/09/2018

Approved 17/12/2018

Final version submitted 19/12/2018

