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MORTALITY FROM CHRONIC NON-TRANSMISSIBLE DISEASES IN ITALIAN AND BRAZILIAN ELDERLY: A PRE-PANDEMIC ANALYSIS SARS-CoV-2

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ABSTRACT

Aim: Analyze some data available by the main Italian and Brazilian agencies on mortality of elderly people in both countries before the SARS-CoV-2 pandemic from non-communicable chronic diseases (NCD). **Materials and methods**: Descriptive and comparative study, retrieved from the database of the National Italian Institute of Statistics (Istituto Nazionale di Statistica) and for the Brazilian population, from the database of the Department of Informatics of the Unified Health System (DATASUS). The results acquired in the databases were organized in a table according to the region / country and age group / sex. We used multiple correspondence analysis (ACM) to explore the relationship between six age / sex variables (eg, male general, male 60-69, male 70-79, female general, female 60-69, female 70-79) and 13 regions / country. **Results:** It was possible to draw some inferences about what are the main incidences of diseases related to sex and economic regions: there is a different relationship between mortality rate and age group between the different Brazilian and Italian regions. The highest mortality among Italian and Brazilian women is in low-income regions. Men have higher mortality in other regions, with an early mortality compared to women. **Discussion:** The results indicate that the relationship between mortality rate and age group differs between the different regions of Brazil and Italy. If, on the one hand, women over 70 had higher mortality from NCDs in 2017 in the South and in the Italian islands (Sardinia and Sicily), men in a similar age group had higher mortality in the Center and Northwest of Italy. In Brazil, higher mortality in women was observed in the Northeast, while men aged 60 to 69 years had a higher mortality rate in all other regions, except for Brasília. **Conclusion:** The findings indicate that the relationship between mortality rate and age group diverge between different Brazilian and Italian regions. Higher mortality in Italian and Brazilian women was found in regions with low income. On the other hand, men have higher mortality in other regions.

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INTRODUCTION

SARS-CoV-2 changed the scenario of deaths among elderly people in Brazil and Italy(GUIGONI; FERRARI, 2020), but this cannot fail to reflect on the scenarios that preceded these deaths, or the fact that the elderly already had comorbidities, which together SARS-CoV-2 worsened the situation and caused the death of many of them. Within this framework, therefore, it is necessary to pay for public health as a challenge faced by different countries and to define new universal and free public health policies.

These new policies involve planning, budgeting and the commitment of all public agents, managers, doctors, nurses and other health professionals(GREER; MÉNDEZ, 2015). Regarding planning, an epidemiology can contribute significantly while affecting the prevalence of diseases and their forms of prevention, which is why Epidemiological Surveillance has been institutionalized in several countries (BENZIGER; ROTH; MORAN, 2016). Both in Italy and in Brazil, statistical data on mortality are helping Epidemiological Surveillance in the elaboration of public policies to know the outcomes of Chronic Noncommunicable

Diseases (NCDs) in the elderly (CONTARELLO et al., 2016; FREITAS; DONALISIO, 2018), allowing the adoption of preventive measures and control of such diseases. Regarding the epidemiology of aging, it should be taken into account that the prevalence of NCDs in the elderly is mainly arterial hypertension, type 2 diabetes mellitus and dyslipidemia (SOUZA et al., 2016). Arterial hypertension is a chronic disease, which can lead to several other health problems, such as kidney dysfunction, stroke, stroke, among other diseases (ASSOCIATION, 2017b). Type 2 diabetes mellitus can also lead to the worsening of these problems, in addition to total blindness and thrombosis (ASSOCIATION, 2017a). Dyslipidemia has outcomes for the problems of atherosclerosis, peripheral vascular diseases, the appearance of plaques in the heart and carotids, which are the cause of strokes and strokes (KOPIN; LOWENSTEIN, 2017). Mortality among elderly people withSARS-CoV-2 was proportionally higher than any other age group, according to the report by the IstitutoSuperiore di Sanità (ISS) in Italy(ISTITUTO SUPERIORE DI SANITÀ, 2020). The average age of positive and deceased patients at SARS-CoV-2 is 81 years, mostly men and in more than two-thirds of cases they have three or more pre-existing diseases. This ISS report from April 2020 points out that the average age of patients examined is 81 years, around 20 years higher than that of patients who contracted the infection, and women are 28 (26.7%). Most deaths 42.2% occurred in the age group between 80 and 89 years, while 32.4% were between 70 and 79, 8.4% between 60 and 69, 2.8% between 50 and 59 and 14.1 % over 90 years.

Women who died after contracting SARS-CoV-2 infection are older than men (women with a median age of 83.4 - men with a median of 79.9). The average number of pathologies observed in this population is 3.4 (median 3, standard deviation 2.1). In general, 15.5% of the sample had 0 or 1 pathologies, 18.3% had 2 pathologies and 67.2% had 3 or more pathologies. The most represented comorbidity is hypertension (present in 74.6% of the sample), followed by ischemic heart disease (70.4%) and diabetes mellitus (33.8%). Also in Brazil, the age group that most suffered was that of people over 60, with 72% of deaths due to the coronavirus pandemic, according to data from the Ministry of Health (MS)(MINISTÉRIO DA SAÚDE - BRASIL, 2020). According to the National Household Sample Survey (PNAD) of the Brazilian Institute of Geography and Statistics (IBGE)(IBGE, 2019), the elderly represent 16.2% of the entire Brazilian population, which is 210.1 million people. The data of MS show that 85% of deaths were from people with at least one NCD, including heart disease and diabetes, among the most frequent, followed by lung diseases and kidney disease. The number of 9 people in 10 died from coronavirus over the age of 60, varying between 58.8% and 65% of deaths were men and among women ranged from 41.2% to 35%. The purpose of this article is to relate chronic non-communicable diseases (NCDs) in the elderly that lead to mortality before the SARS-CoV-2 pandemic, which has triggered the number of elderly people killed with comorbidities in Brazil and Italy. The idea is that, once these two countries are monitored on the mortality of the elderly before the pandemic, one can think of policies to prevent injuries and outcomes that weaken elderly people in the face of severe respiratory syndromes, also allowing other nations to be compared and the differences evidenced, not allowing the lack of effective public policy implementations to be interpreted. The main contribution of the research, consists in accessing the quantitative similarities and differences by sex and diseases, which reveal the cultural and practical peculiarities between Italy (as a developed country) and Brazil (as a recently developed country), with regard to prevention and monitoring of comorbidities in the elderly.

MATERIALS AND METHODS:

Study Design and Configuration: This is a descriptive study that aimed to describe and compare the mortality rate due to chronic noncommunicable diseases in elderly Italian and Brazilian pre-pandemic SARS-CoV-2.

Italian Database: The mortality rate of the Italian population was retrieved from the database of the National Italian Institute of Statistics (Istituto Nazionale di Statistica)(ISTITUTO NAZIONALE DI STATISTICA, [s.d.]). The last available SARS-CoV-2 pre-pandemic survey is from the year 2017. Data were selected using the filters of initial cause of death, according to the Europe Short List, sex, age group and region. The age groups used for selection were 60-64 years, 65-69 years, 70-74, and 75-79 years. Data from the South (eg, Apulia, Abruzzo), Center (eg, Tuscany, Lazio), Northwest (eg, Lombardy, Piedmont), Northeast (eg, Veneto, Emilia-Romagna) and insular (eg, Sicily and Sardinia) regions were available. NCDs included in the present study involved endocrine, psychic, neurological, cardiovascular, pulmonary, musculoskeletal, immunological and genetic disorders.

Brazilian Database: The mortality rate of the Brazilian population was quantified from the data available in the database of the Department of Informatics of the Unified Health System (DATASUS)(DATASUS, [s.d.]). The last available pre-pandemic survey SARS-CoV-2 is from 2018. Data were selected from the Mortality database - 1996 to 2018, by ICD-10, General Mortality, Brazil by Region and Federation Unit. The data were retrieved and arranged in columns (e.g., Deaths from preventable causes from 5 to 74 years old - Brazil) and rows (e.g., Deaths by Residency by Region and detailed Age Range). The age groups used were 60-64 years, 65-69 years, 70-74 years, and 75-79 years. The regions included were North (eg, Amazonas, Acre), Northeast (Bahia, Pernambuco), Southeast (eg, São Paulo, Minas Gerais), South (Rio Grande do Sul, Paraná), Midwest (Goiás, Mato Grosso) and Distrito Federal. Chronic non-communicable diseases are available through DATASUS in accordance with ICD-10.

Statistical analysis: The results acquired in the databases were organized in a table according to the region / country and age group / sex. We used multiple correspondence analysis (ACM) to explore the relationship between six age / sex variables (eg, male general, male 60-69, male 70-79, female general, female 60-69, female 70-79) and 13 regions / country. The ACM builds a matrix and returns to the graphical representation of the results in which the categories of the most associated variables are plotted closer together than those not associated. The nearby categories form combinations. The eigenvalues provide a measure of how many categories of variables are responsible for each dimension. The higher the eigenvalues, the greater the percentage of the total variance explained by the variables in this dimension. The statistical package SPSS 16.0 for Windows (SPSS 13.0; SPSS Inc., Chicago, IL, USA) was used to perform the statistical analysis.

RESULTS

Table 1 shows the gross mortality results according to age / sex and regions / country. In 2017, 81,785 thousand male elderly and 49,015 thousand female elderly died in Italy due to NCDs. In turn, in Brazil, 210,643 thousand deaths in elderly males and 150,833 thousand deaths in elderly females were recorded in DATASUS.

Table 1. Mortality Rate in Elderly Brazilians and Italians

	Country												
Age_Gender (n)	*Italy*									*Brazil*			
	Center	*Islands*	*Northeast*	*Northwest*	*South*	*General*	*North*	*Northeast*	*Southeast*	*South*	*Midwest*	*Distrito Federal*	*General*
Male 60-69	4781	3299	4200	6111	7046	25437	7678	30537	66039	23092	9161	445	136952
Male 70-79	10802	7003	10112	14305	14126	56348	4142	17349	34356	12868	4777	199	73691
Male general	15583	10302	14312	20416	21172	81785	11820	47886	100395	35960	13938	644	210643
Female 60-69	2151	1451	1563	2524	3155	10844	4953	22081	44873	14662	6053	325	92947
Female 70-79	7035	5172	6125	9069	10770	56348	3022	14233	27108	9564	3745	214	57886
Femalegeneral	9186	6623	7688	11593	13925	49015	7975	36314	71981	24226	9798	539	150833

Figure 1 shows the results of the ACM. The existence of conglomerates and the proximity of variables configure the patterns of relationships between them. The greater the proximity in the graph, the greater the joint occurrence of the variables. For better understanding, the clusters of variables were surrounded. The first agglomeration observed in the upper left corner is between NCD mortality in the South and in the Italian islands and women between 70 and 79 years old. On the other hand, mortality in Central and Northwestern Italy has been shown to be associated with men aged 70-79 years. In Brazil, being female was associated with mortality in the Northeast, while the mortality rate in all other regions, except for Brasília, was more frequent in men aged 60-69 years.

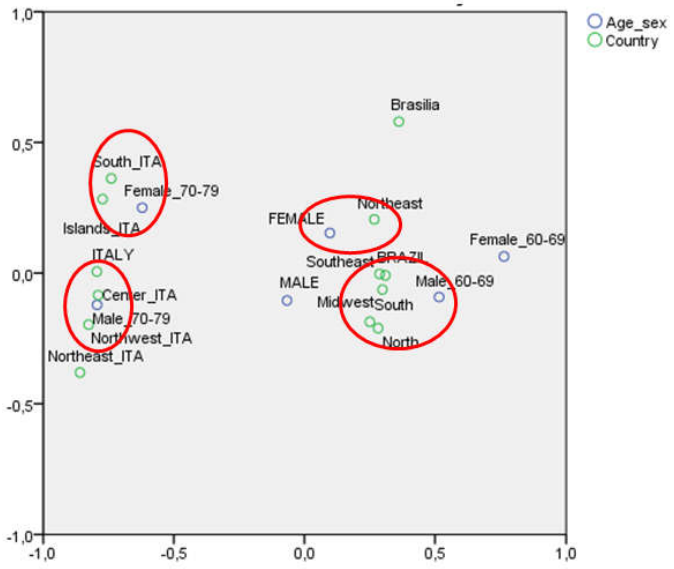

Figure 1. Multiple correspondence analysis for age_sex and region_country. BRA = Brazil; ITA = Italy

DISCUSSION

The present study aimed to investigate the relationship between mortality rate, age and regionality in Italian and Brazilian elderly. The results indicate that the relationship between mortality rate and age group differs between different Brazilian and Italian regions. In fact, if, on the one hand, women over 70 years of age had higher mortality from NCDs in 2017 in the South and in the Italian Islands (Sardinia and Sicily), men in a similar age group had higher mortality in the Center and Northwest of Italy. In Brazil, higher mortality in women was observed in the Northeast, while men aged 60 to 69 years had a higher mortality rate in all other regions, except for Brasília. This study shows that some socioeconomic peculiarities in the Brazilian and Italian contexts may be associated with mortality. Notably, high mortality rates in women have been observed in the Italian (eg, Calabria, Basilicata) (ISTITUTO NAZIONALE DI STATISTICA, [s.d.]) and Brazilian (eg, Maranhão, Paraíba) (INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA, 2020) regions with low economic activity according to the gross domestic product (GDP) per capita. These results are supported by countless evidences in the literature(FISCELLA; FRANKS, 2000; FRANKS; GOLD; FISCELLA, 2003; WILKINSON; PICKETT, 2006), which reported a strict relationship between the socioeconomic context and mortality. This phenomenon is permeated by multiple factors and the indication of a single mediating covariate is unlikely. However, these findings may reflect a state of social stratification at the national level, where regions that offer lower economic productivity receive less attention from federal offices(WILKINSON; PICKETT, 2006). Low-income areas usually have a limited number of mutual social environments, with the few existing poor care and precarious, contributing to a low perspective on oneself, feelings of inferiority, psychological stress, increased depressive symptoms, and less health care in general, including cardiometabolic(FISCELLA; FRANKS, 2000; WILKINSON; PICKETT, 2006). In relation to women, these results suggest unequal care, especially in the post-menopausal period, where there is an increased risk of cardiovascular death(JACOBSEN; HEUCH; KVÅLE, 2004). In fact, menopause has several metabolic consequences for women(DAVIS et al., 2015), such as a decrease in the basal metabolic rate, an increased predisposition to increased body fat weight, and a redistribution of body fat, privileging visceral adiposity, and therefore therapies are needed that can contribute to the management of these conditions in the short and long term, such as the supervised practice of physical exercises and the adequate consumption of macro and micronutrients. However, access to these conditions in low-income regions is still scarce(LEAR et al., 2017).The opposite happened with Brazilian(INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA, 2020) and Italian(ISTITUTO NAZIONALE DI STATISTICA, [s.d.]) men, as the higher mortality occurred in high GPD per capita.

Many epidemiological studies support these results, since men are at higher risk of death from cardiovascular and metabolic diseases compared to women(MOSCA; BARRETT-CONNOR; WENGER, 2011; WANG et al., 2012). These findings may represent the remnants of the impact of the patriarchal model of the 1930s, 40s and 50s, where family understanding and organization are determined by the father, who is the holder of power(NARVAZ; KOLLER, 2006). In this sense, the man is directly responsible for the economic

supply of the home, leading him to long and stressful working hours and deprivation of health care(COHEN et al., 1991; NIEDHAMMER et al., 1998; WARDLE et al., 2000; WEMME; ROSVALL, 2005). In fact, alcohol consumption, tobacco use, poor eating habits, and sedentary behavior are highly prevalent in men with high levels of stress due to high demands at work(COHEN et al., 1991; NIEDHAMMER et al., 1998; WARDLE et al., 2000; WEMME; ROSVALL, 2005). This lifestyle contributes to the genesis of systemic arterial hypertension, obesity, and dyslipidemia in men, possibly explaining the high mortality rates(NIEDHAMMER et al., 1998). Another important finding of the present study is related to the early mortality observed in Brazilian men. The impact of males on mortality is well established and has been described in the literature(DICKER et al., 2018). According to the World Health Organization (WHO), in 2019, women have an average life expectancy ~ 8% higher than men(WHO, 2020). In addition to the risk factors mentioned above, the protective role of estrogen in cardio-metabolic health in the woman's fertile period and the expression of regulatory genes can influence these results(MIKKOLA et al., 2013). Finally, we note that mortality in the Federal District was not associated with any of the age groups studied in the present study. It is important to note that the Federal District has the highest GDP per capita in Brazil(INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA, 2020), approximately 90% of adequate sanitation, 40% of afforestation in public areas, and a 6-14 year schooling rate close to 100% (97.5%)("Cidades@ | Distrito Federal | Brasília | Panorama", [s.d.]). In addition, the Federal District has been undergoing the "Health Sector Reform of the Government of the Federal District", with the expansion, improvement of quality, and strengthening of primary health care, especially in regions of greater vulnerability, organization of secondary care, and investment in more complex conditions (eg, beds and equipment for intensive care units [ICU]) ("Cidades@ | Distrito Federal | Brasília | Panorama", [s.d.]; GÖTTEMS et al., 2019). Evidence from original studies indicates that the infant mortality rate, prevalence of AIDS, leprosy, congenital syphilis, as well as mortality from tuberculosis, are lower in the Federal District compared to the Midwest region (SELLERA et al., 2019). Thus, it is possible to propose that cardio-metabolic health parameters may also be better in this region. Although this reform is still insufficient to meet all the needs of the growing population, it is possible that the improvement in health parameters has influenced the longevity of the population of the Federal District, which is among the three largest in Brazil(INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA, [s.d.]). In this sense, a possible significance between the mortality rate and this region would only be found in octogenarian and nonagenarian subjects. The data in this study have practical application, as they can be seen as a starting point for some preliminary considerations: preventive actions and policies aimed at the health of Italian and Brazilian women living in low-income regions. This approach seems to be necessary mainly in primary health care, avoiding the development or, at least, the progression of cardiovascular and metabolic health factors. In men, preventive actions should start earlier, since this population has early mortality.

Conclusion

The findings indicate that the relationship between mortality rate and age group diverge between different Brazilian and Italian regions. Higher mortality in Italian and Brazilian women was found in regions with low income. On the other hand, men have higher mortality in other regions. We also note that men have an early mortality compared to women. Finally, mortality in the Federal District was not associated with any of the age groups studied in the present study. The present study is not without limitations. First, the results are based on population databases and are not normalized by several cofactors. Second, the age group is restricted and does not include elderly people aged eighty or older. Third, the latest available data are for 2017-2018 and, although unlikely, may be different pre-pandemic.

Conflicts of Interest: None to declare.

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