ORIGINAL ARTICLE

Sociodemographic and residential factors associated with multimorbity: results of Brumadinho Health Project

Fatores sociodemográficos e de área de residência associados à multimorbidade: resultados do Projeto Saúde Brumadinho

Mary Anne Nascimento-Souza[I] , Josélia Oliveira Araújo Firmo[I] ,
Paulo Roberto Borges de Souza Júnior[II] , Sérgio Viana Peixoto[I,III]

[I]Fundação Oswaldo Cruz, Institute René Rachou, Center for Studies in Public Health and Aging – Belo Horizonte (MG), Brazil.
[II]Fundação Oswaldo Cruz, Institute of Communication and Scientific and Technological Information in Health – Rio de Janeiro (RJ), Brazil.
[III]Universidade Federal de Minas Gerais, Nursing School, Department of Health Management – Belo Horizonte (MG), Brazil.

ABSTRACT

Objective: To evaluate the prevalence of multimorbidity and sociodemographic and residential factors associated with this condition among adults living in Brumadinho, Minas Gerais. **Methods:** Cross-sectional study with baseline data from the Brumadinho Health Project, conducted in 2021 and comprising 2,777 individuals aged 18 years and over. The outcome variable was multimorbidity, defined by the existence of two or more of 20 chronic diseases. The exploratory variables were sex, age group, educational level, skin color and area of residence according to the dam failure. The association between exploratory variables and multimorbidity was assessed by logistic regression. **Results:** The prevalence of multimorbidity was 53.8% (95%CI 50.6–56.9). A greater chance of multimorbidity was found among women (adjusted OR=2.5; 95%CI 1.9–3.2), in participants aged between 40 and 59 (adjusted OR=2.8; 95%CI 1.8–4.3) or 60 years and older (adjusted OR=7.9; 95%CI 4.7–13.4) and in residents of the areas that were directly affected by the dam failure (adjusted OR=1.6; 95%CI 1.3–2.0). **Conclusion:** The burden of multimorbidity on the population of Brumadinho requires effective preventive measures and actions to the whole population, but mainly to the most vulnerable groups, that is, women, middle-aged and older individuals, and those directly affected by the dam failure, in addition to a timely provision of health care to reverse this situation.

Keywords: Multimorbidity. Chronic disease. Man-made disasters. Socioeconomic factors. Mining. Cohort.

CORRESPONDING AUTHOR: Mary Anne Nascimento-Souza. Avenida Augusto de Lima, 1.715, Barro Preto, CEP: 30190-002, Belo Horizonte (MG), Brazil. E-mail: maryannemoc@yahoo.com.br

CONFLICT OF INTERESTS: nothing to declare.

INTRODUCTION

Chronic non-communicable diseases (NCDs), namely cardiovascular diseases, cancer, chronic respiratory diseases and diabetes, are global threats and major challenges for Public Health[1]. The simultaneous occurrence of two or more chronic diseases in the same individual is frequent, and becomes a condition referred to multimorbidity[2]. This health outcome is highly prevalent in the world population[3] and is associated with higher risk of mortality, functional decline and poor quality of life, in addition to difficulty in adequate handling by health services[4].

The health impacts of a disaster can be immediate or long-term[5]. As for long-term, previous studies conducted in populations affected by different types of disasters showed an increase in the incidence of cardiovascular[6] and cerebrovascular diseases, psychological problems, and other chronic conditions[5]. Also, individuals with NCDs are particularly vulnerable to disasters. In addition to issues related to the circumstances of the disaster, these individuals may experience worsening of their chronic conditions due to interruption of medical treatment, lack of access to medication, among others[7].

On January 25, 2019, in Brumadinho, a municipality in the Metropolitan Region of Belo Horizonte, Minas Gerais, Brazil, the tailings dam at the mine Córrego do Feijão burst, under the responsibility of mining company Vale S.A. It reached a considerable territorial extension, caused dozens of deaths and left several missing people[8]. Seeking to monitor the effects of this disaster on the health of this population, the Brumadinho Health Project[9]—a prospective cohort study—is ongoing in this municipality. It aims to produce information on the health-related conditions of this population, including chronic diseases, to help the health service to offer better care to residents, thus minimizing the impacts of the disaster.

Previous studies have shown that sociodemographic factors are determinants of multimorbidity[10]. However, to the best of our knowledge, few authors[11] have evaluated the influence of these factors on multimorbidity in a population affected by disasters so far. Understanding the occurrence, determinants and impacts of multimorbidity in the population of Brumadinho can be useful for the development of effective strategies by the health services, early identification of the most vulnerable groups, and prevention of future health conditions, thus ensuring better quality of life for this population.

In this context, the objective of this article was to evaluate the prevalence of multimorbidity, as well as sociodemographic and residential factors associated with this condition among adults living in Brumadinho, Minas Gerais.

METHODS

Source of Data

This is a cross-sectional study carried our based on the Brumadinho Health Project, a study conducted in the city of Brumadinho, a Brazilian municipality in the state of Minas Gerais with estimated population of 41,208 inhabitants in 2021[12]. The Brumadinho Health Project is coordinated by the Oswaldo Cruz Foundation in Minas Gerais (Fiocruz Minas) and Universidade Federal do Rio de Janeiro (UFRJ); it was approved by the Research Ethics Committee of Fiocruz Minas (20814719.5.0000.5091) and all participants signed a free and informed consent form[9].

The baseline sample of the study was designed to represent the population aged 12 years or older residing in the municipality of Brumadinho. The sample was also designed to obtain information in three different estimation domains, according to area of residence versus dam failure:
1. Estimation of the population "not directly affected" by the dam failure or mining activity;
2. People "directly affected" by the rupture of the tailings dam at the mine Córrego do Feijão; and
3. People who "lived in areas with mining activity".

The sampling plan considered the stratification of the population surveyed by census sector, as established in 2019 by the Brazilian Institute of Geography and Statistics (IBGE). All households in regions affected by the disaster or with mining activity (Census) were included, as well as a random sample of families residing in sectors considered to be not directly affected. The sample from the area not directly affected included seven households (primary sampling units) selected by simple inverse sampling in each of the 107 sampled census tracts. For each selected household, both in the census and sampling regions, all residents aged 12 years or older who consented to participate in the research were interviewed. Between June and November 2021, a total of 3,080 people were interviewed, and all participants aged 18 or over were considered for the present analysis.

More details about the research are to be found on the webpage of the project (http://www.minas.fiocruz.br/saudebrumadinho/), in the article on its methodology[9].

Variables and Procedures for Data Collection

Multimorbidity, the outcome variable of this analysis, was defined as the presence of two or more chronic diseases[2]. Conditions included were: high blood pressure or hypertension, diabetes, high cholesterol, history of heart attack, angina, heart failure, stroke, asthma or asthmatic bronchitis, lung disease (chronic bronchitis, emphysema, or chronic obstructive pulmonary disease), pneumonia, arthritis, or rheumatism, chronic back problem (back pain, neck pain, low back pain, sciatic nerve pain, spinal or spinal disc problems), cancer, chronic kidney failure, gastritis or ulcer, thyroid disease or problems, liver disease (except hepatitis), depression, psychiatric problems (schizophrenia, bipolar disorder, psychosis, panic disorder or obsessive-compulsive disorder), and anxiety or sleep disorder. The presence or absence of these diseases was evaluated

epidemio.

Multimorbidity: results of Brumadinho Health Project. Rev Bras Epidemiol. 2022; 25:e220006.supl.2   2

through the answers to the following question: "Has a doctor ever said that you have…".

Exploratory variables were selected based on the literature[10] and included: gender (male, female), age group (18–24, 25–39, 40–59, 60 or older), self-reported skin color (white, black, brown, yellow or indigenous), educational level (incomplete elementary school, complete elementary school, complete elementary school II, complete high school, higher education or more) and area of residence, which was evaluated based on three estimation domains (not directly affected, directly affected and mining region).

Statistical analysis

First, the variables included in this study were described for the total sample analyzed, along with a comparison of their percentage distribution between individuals who had multimorbidity or not, using Pearson's chi-square test with Rao-Scott correction. Subsequently, the mean number of associated diseases was calculated for each morbidity. Then, logistic regression models were adjusted for each variable and for the set of exploratory variables included in the study in order to obtain the estimate Odds Ratio (OR) and respective 95% confidence intervals (95%CI).

The goodness of fit of the logistic regression model was evaluated by the Hosmer-Lemeshow test for complex samples[13]. However, given the randomness of this test in relation to the number of groups into which the sample was divided to compare the number of successful results and estimated results by the model, a sensitivity analysis was put in place to verify the impact of changing these groups on the test result.

All variables with a p<0.05 in the adjusted analysis were considered to be associated with the outcome. The Stata® software, version 14.0 (StataCorp LLC, CollegeStation, TX) was used for statistical analyses, considering the weight of the sample and the effect of the sample design.

RESULTS

A total of 2,777 adults participated in this study (99.0% of the total number of adult participants in the Brumadinho Health Project); all of them had complete information for the variables of interest. In this sample, the prevalence of multimorbidity was 53.8% (95%CI 50.6–56.9%).

Table 1 shows the distribution of the study participants' characteristics for the total population and per multimorbidity status. The sample was mainly composed of women (57.2%), people aged between 40 and 59 years (36.2%), with self-reported brown skin color (44.1%), with high school education (29.1%) and residents in an area not considered to be directly affected by the dam failure (95.5%). Multimorbidity was significantly associated (p<0.05) with sex, age group, education, and area of residence.

On average, subjects had 2.2 morbidities. Anxiety or sleep disorder (33.6%), arterial hypertension (30.0%) and

Table 1. Distribution of sociodemographic characteristics and area of residence of the total study population according to presence of multimorbidity. Brumadinho Health Project (MG), 2021.

Variables	Total	Multimorbidity No	Multimorbidity Yes	p-value*
Sex				
Male	42.8	53.4	33.7	<0.001
Female	57.2	46.6	66.3	
Age range (years)				
18-24	11.5	16.8	6.9	<0.001
25-39	21.8	29.3	15.3	
40-59	36.2	37.0	35.4	
60 and over	30.6	16.9	42.3	
Self-reported skin color				
White	43.0	40.3	45.3	0.242
Black	11.8	11.5	12.1	
Brown	44.1	47.2	41.4	
Yellow or indigenous	1.1	0.9	1.2	
Education				
Incomplete Elementary School I	11.1	8.8	13.0	<0.001
Complete Elementary School I	26.0	24.6	27.1	
Complete Elementary School II	16.3	20.3	12.9	
Complete High School	29.1	31.8	26.8	
Higher education	17.5	14.4	20.2	
Area of residence				
Not directly affected	95.5	95.7	95.4	0.019
Directly affected	2.9	2.6	3.1	
Mining region	1.6	1.8	1.4	

*Chi-square test with Rao-Scott correction. Values expressed in percentages.

high cholesterol (23.0%) were the most common conditions, while chronic renal failure (2.8%), stroke (2.2%) and angina pectoris (1.6%) were less frequent. The mean associated morbidities ranged from 2.8 (for anxiety or sleep disorder and arterial hypertension) to 5.4 (for angina pectoris) (Table 2).

In the sensitivity analysis of the Hosmer-Lemeshow test, it was found that changing the number of groups had little impact on the general fit of the model. Thus, the number of groups established in the default of the statistical software was considered (g=10), and the p-value of the Hosmer-Lemeshow test for the adjusted model was 0.881 (Table 3).

Crude and adjusted analyses of the association of sociodemographic and residential characteristics with the presence of multimorbidity are shown in Table 3. In the crude analysis, the variables sex, age group, education and area of residence were significantly associated with multimorbidity. After adjusting the model with all variables, women had 2.5 (95%CI 1.9–3.2) times the chance

epidemio.

Multimorbidity: results of Brumadinho Health Project. Rev Bras Epidemiol. 2022; 25:e220006.supl.2 **3**

Table 2. Prevalence of morbidities and mean of associated diseases. Brumadinho Health Project (MG), 2021.

Morbidities	Prevalence of morbidity % (95%CI)	Average of associated diseases
Anxiety or sleep disorder	33.6 (30.5–36.8)	2.8
Arterial hypertension	30.0 (27.2–32.9)	2.8
High cholesterol	23.0 (20.6–25.7)	3.3
Depression	22.6 (19.9–25)	3.3
Chronic back problem*	21.2 (18.4–24.2)	3.2
Gastritis or ulcer	15.9 (13.7–18.4)	3.4
Pneumonia	9.8 (8.2–11.6)	3.3
Diabetes	9.8 (8.3–11.6)	3.3
Thyroid disease or problem	9.2 (7.5–11.4)	3.5
Psychiatric problems†	7.9 (6.2–9.9)	4.2
Asthma or asthmatic bronchitis	7.2 (5.8–8.9)	3.5
Arthritis or rheumatism	7.0 (5.4–9.0)	4.8
Cancer	3.7 (2.7–5.0)	3.4
Lung diseases‡	3.5 (2.5–4.9)	3.7
Liver disease (except hepatitis)	3.4 (2.5–4.6)	4.3
Heart failure	3.2 (2.3–4.3)	4.9
heart attack	3.2 (2.1–4.8)	4.8
Chronic kidney failure	2.8 (2.0–3.8)	4.5
Stroke	2.2 (1.5–3.3)	4.6
Angina	1.6 (1.0–2.5)	5.4

95%CI: 95% confidence interval. *Includes back pain, neck pain, low back pain, sciatic nerve pain, problems in the vertebrae or vertebral discs; †Includes schizophrenia, bipolar disorder, psychosis, panic disorder, or obsessive-compulsive disorder; ‡Includes chronic bronchitis, emphysema, or chronic obstructive pulmonary disease.

Table 3. Crude and adjusted analysis of associations between sociodemographic characteristics, area of residence and multimorbidity. Brumadinho Health Project (MG), 2021.

Variables	Multimorbidity*	
	Crude OR (95%CI)	Adjusted OR (95%CI)
Sex		
Male	1.0	1.0
Female	2.3 (1.8–2.9)	2.5 (1.9–3.2)
Age range (years)		
18-24	1.00	1.0
25-39	1.3 (0.8–2.0)	1.4 (0.9–2.2)
40-59	2.3 (1.5–3.5)	2.8 (1.8–4.3)
60 and over	6.1 (3.9–9.5)	7.9 (4.7–13.4)
Self-reported skin color		
White	1.0	1.0
Black	0.9 (0.6–1.4)	1.1 (0.7–1.8)
Brown	0.8 (0.6–1.0)	1.1 (0.8–1.1)
Yellow or indigenous	1.1 (0.4–3.0)	1.5 (0.5–4.0)
Education		
Incomplete Elementary School I	1.0	1.0
Complete Elementary School I	0.7 (0.5–1.1)	1.1 (0.7–1.6)
Complete Elementary School II	0.5 (0.3–0.7)	1.0 (0.7–1.5)
Complete High School	0.6 (0.4–0.8)	1.4 (0.9–2.1)
Higher education	1.0 (0.7–1.5)	1.2 (0.8–1.9)
Area of residence		
Not directly affected	1.0	1.0
Directly affected	1.2 (1.1–1.5)	1.6 (1.3–2.0)
Mining region	0.8 (0.6–1.1)	1.0 (0.8–1.3)

OR (95%CI): crude and adjusted odds ratio (95% confidence interval) for all variables listed. p-value from Hosmer-Lemeshow test for the adjusted model 0.881. *Two or more chronic diseases among 20 morbidities assessed.

of having multimorbidity when compared to men. Regarding age groups, participants aged between 40 and 59 or aged 60 years or older had, respectively, 2.8 (95%CI 1.8–4.3) and 7.9 (95%CI 4.7–13,4) times the chance of having multimorbidity when compared to participants aged 18 to 24 years. Finally, multimorbidity occurred in a 60.0% frequency (OR$_{adjusted}$=1.6; 95%CI 1.3–2.0), being higher among respondents living in areas directly affected by the dam failure versus those residing in areas not directly affected.

DISCUSSION

The results of this study show a high percentage of adults with two or more chronic diseases, being more common among women, among the elderly and among people living in areas directly affected by the dam failure.

A meta-analysis of large epidemiological studies has shown that the prevalence of multimorbidity can vary considerably between studies (from 15.3 to 93.1%)[14]. A recent study reported that the combined global prevalence of multimorbidity obtained from community studies conducted in low-, middle- and high-income countries was 33.1%[15], which is lower than in the population participating in the

Brumadinho Health Project (53.8 %). A study that analyzed, in 2013, data obtained by the Surveillance System of Risk and Protection Factors for Non-Communicable Chronic Diseases (Vigitel) showed a 18.2% prevalence (95%CI 17.5–18.9) of multimorbidity among Brazilians aged 18 years and over, evaluated as presence of two or more out of five chronic conditions[16].

The lack of consensus on an operational definition of multimorbidity[17] results in a wide range of prevalence estimates and in a difficulty in comparing results between different populations. Among the factors that influence differences between prevalence values and that could explain the higher prevalence of multimorbidity for the population of Brumadinho are the list of diagnoses considered and the cut-off point used to define multimorbidity[18]. Regarding the number of conditions, a systematic review of studies on the prevalence of multimorbidity in the general population reported that the prevalence of this outcome was considerably underestimated for studies using a list of less than 12 chronic

epidemio.

Multimorbidity: results of Brumadinho Health Project. Rev Bras Epidemiol. 2022; 25:e220006.supl.2   **4**

conditions. However, there was less variation in studies that used 12 conditions or more[18].

The high prevalence of multimorbidity reported in this study may also stem from the way the outcome was defined in relation to the cut-off point. Higher prevalence values of multimorbidity were verified in a meta-analysis when the authors used the definition of two or more chronic diseases versus three or more[15]. In line with the findings of this meta-analysis, the prevalence of multimorbidity was 35.0% (95%CI 32.5–38.1) for the population of Brumadinho, when considering the cutoff point of three diseases. However, the significance and direction of the associations originally observed were maintained (data not shown).

It should also be noted that Brumadinho is 100.0% covered by the Family Health Strategy (FHS)[19]. The influence of good access to health services on the diagnosis of some health conditions have been previously demonstrated by some authors[20]. In this way, universal coverage by the FHS can favor access to health services and the diagnosis of chronic conditions, mainly because they come from a self-reported medical diagnosis, contributing to a higher prevalence of multimorbidity in the population studied.

The higher occurrence of multimorbidity among women has already been verified previously[10]. This may be due to the fact that women are more careful with their health, and to issues related to gender inequalities existing in our society[21]. Women tend to seek health services more often, whether for preventive care or specific reproductive health issues[21,22], so they are, consequently, more likely to receive a medical diagnosis of chronic diseases. This result is corroborated by data presented in a recent study conducted with the Brazilian population that compared, based on information from the 2013 and 2019 editions of the National Health Survey (PNS), the patterns of use of health services. The authors found higher prevalence of search for health care, either for prevention or due to health problems, by women[22] in the last two weeks prior to the survey.

Regarding age, a systematic review that wanted to check the determinants of multimorbidity in Primary Care patients found that almost all observational studies included reported an association between multimorbidity and age, which shows that this is a well-established determinant in the literature[10]. Therefore, the Brumadinho Health Project also corroborate previous studies[23], which demonstrate that additional years of life are an opportunity to acquire other chronic diseases[10]. Also, the results showed that, although multimorbidity is considered a health problem among the elderly, a substantial number of young and middle-aged people are also affected[24,25]. Early occurrence of multimorbidity can prolong the time spent with health problems as people age[24]; thus, middle age is an important moment for prevention of chronic diseases, in which successful aging is aimed[26].

Previous studies have shown a higher incidence of chronic diseases after the occurrence of disasters. For example, a systematic review with meta-analysis found an increase in all-cause, myocardial infarction, and stroke mortality rates in the first month and up to three years after an earthquake in high-income countries[27]. Another study highlighted the increase in rates of psychological distress and psychiatric disorders after natural disasters[28]. It shows the need for monitoring a wide range of physical and mental health outcomes in populations affected by disasters. In this study, residents in areas directly affected by the dam failure had a higher chance of presenting with multimorbidity when compared to the analyzed areas. However, although a growing number of studies demonstrate long-term effects of disasters on health, it should be noted that our findings here does not allow us to infer whether this profile of greater chance of multimorbidity among people affected precedes or is a consequence of the disaster. However, it illustrates the greater vulnerability of this population, which needs a different look in terms of health care actions, since the burden of disease is greater for them.

Our study has some limitations that must be considered. First, measuring multimorbidity based on a list of self-reported diseases, as well as the lack of concept standardization and operationalization of this construct made it difficult to compare results with other populations. A future standardization of multimorbidity will allow comparison between studies conducted with different populations, as well as a better assessment of consistency of results obtained. Despite these limitations, this was the first population-based study conducted in Brazil to assess multimorbidity in a population affected by a major disaster. Monitoring health conditions of this population is an important baseline for future longitudinal analyses to assess the impact of multiple diseases in relation to health outcomes and health services.

The Brumadinho Health Project showed a high prevalence of multimorbidity in the population studied, a condition influenced by sociodemographic and residential factors. Proper long-term management of multiple chronic diseases is one of the greatest health-related challenges faced by patients, health professionals and the society as a whole, as it funds public health services. It should be noted that, in the face of a disaster, these challenges can be greater given the possible overload of local health services.

Thus, the impact of NCDs on the population of Brumadinho requires effective preventive measures and actions to the whole population, but mainly among the most vulnerable groups, namely women, middle-aged and elderly individuals, as well as those directly affected by the disruption of the dam, in addition to timely provision of health care to minimize this situation.

epidemio.

Multimorbidity: results of Brumadinho Health Project. Rev Bras Epidemiol. 2022; 25:e220006.supl.2   5

REFERENCES

1. World Health Organization. Noncommunicable diseases [Internet]. 2021 [cited on Jun 7, 2022]. Available from: https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases

2. World Health Organization. Multimorbidity. Technical series on safer primary care [Internet]. 2016 [cited on Jun 22, 2022]. Available from: https://apps.who.int/iris/bitstream/handle/10665/252275/9789241511650-eng.pdf

3. Harrison C, Britt H, Miller G, Henderson J. Examining different measures of multimorbidity, using a large prospective cross-sectional study in Australian general practice. BMJ Open 2014; 4(7): e004694. https://doi.org/10.1136/bmjopen-2013-004694

4. Marengoni A, Angleman S, Melis R, Mangialasche F, Karp A, Garmen A, et al. Aging with multimorbidity: a systematic review of the literature. Ageing Res Rev 2011; 10(4): 430-9. https://doi.org/10.1016/j.arr.2011.03.003

5. Murakami A, Sasaki H, Pascapurnama DN, Egawa S. Noncommunicable diseases after the great east Japan earthquake: systematic review, 2011–2016. Disaster Med Public Health Prep 2018; 12(3): 396-407. https://doi.org/10.1017/dmp.2017.63

6. Gautam S, Menachem J, Srivastav SK, Delafontaine P, Irimpen A. Effect of Hurricane Katrina on the incidence of acute coronary syndrome at a primary angioplasty center in New Orleans. Disaster Med Public Health Prep 2009; 3(3): 144-50. https://doi.org/10.1097/DMP.0b013e3181b9db91

7. Jhung MA, Shehab N, Rohr-Allegrini C, Pollock DA, Sanchez R, Guerra F, et al. Chronic disease and disasters medication demands of Hurricane Katrina evacuees. Am J Prev Med 2007; 33(3): 207-10. https://doi.org/10.1016/j.amepre.2007.04.030

8. Peixoto SV, Asmus CIRF. O desastre de Brumadinho e os possíveis impactos na saúde. Cienc Cult 2020; 72(2): 43-6. http://dx.doi.org/10.21800/2317-66602020000200012

9. Peixoto SV, Firmo JOA, Fróes-Asmus CIR, Mambrini JVM, Freitas CM, Lima-Costa MF, et al. Projeto Saúde Brumadinho: aspectos metodológicos e perfil epidemiológico dos participantes da linha de base da coorte. Rev Bras Epidemiol 2022; (supl 2): E220002. https://doi.org/10.1590/1980-549720220002.supl.2.1

10. Violan C, Foguet-Boreu Q, Flores-Mateo G, Salisbury C, Blom J, Freitag M, et al. Prevalence, determinants and patterns of multimorbidity in primary care: a systematic review of observational studies. PLoS One 2014; 9(7): e102149. https://doi.org/10.1371/journal.pone.0102149

11. Demirchyan A, Khachadourian V, Armenian HK, Petrosyan V. Short and long term determinants of incident multimorbidity in a cohort of 1988 earthquake survivors in Armenia. Int J Equity Health 2013; 12: 68. https://doi.org/10.1186/1475-9276-12-68

12. Brasil. Instituto Brasileiro de Geografia e Estatística. Cidades. Brumadinho [Internet]. 2021 [cited on Jun 7, 2022]. Available from: https://cidades.ibge.gov.br/brasil/mg/brumadinho/panorama

13. Archer KJ, Lemeshow S, Hosmer DW. Goodness-of-fit tests for logistic regression models when data are collected using a complex sampling design. Computational Statistic & Data Analysis 2007; 51(9): 4450-64. https://doi.org/10.1016/j.csda.2006.07.006

14. Chua YP, Xie Y, Lee PSS, Lee ES. Definitions and prevalence of multimorbidity in large database studies: a scoping review. Int J Environ Res Public Health 2021; 18(4): 1673. https://doi.org/10.3390/ijerph18041673

15. Nguyen H, Manolova G, Daskalopoulou C, Vitoratou S, Prince M, Prina AM. Prevalence of multimorbidity in community settings: a systematic review and meta-analysis of observational studies. J Comorb 2019; 9: 2235042X19870934. https://doi.org/10.1177/2235042X19870934

16. Christofoletti M, Del Duca GF, Gerage AM, Malta DC. Simultaneity of chronic noncommunicable diseases in 2013 in Brazilian state capital cities: prevalence and demographic profile. Epidemiol Serv Saude 2020; 29(1): e2018487. https://doi.org/10.5123/S1679-49742020000100006

17. Johnston MC, Crilly M, Black C, Prescott GJ, Mercer SW. Defining and measuring multimorbidity: a systematic review of systematic reviews. Eur J Public Health 2019; 29(1): 182-9. https://doi.org/10.1093/eurpub/cky098

18. Fortin M, Stewart M, Poitras ME, Almirall J, Maddocks H. A systematic review of prevalence studies on multimorbidity: toward a more uniform methodology. Ann Fam Med 2012; 10(2): 142-51. https://doi.org/10.1370/afm.1337

19. Brasil. E-Gestor Atenção Básica. Informação e Gestão da Atenção Básica. Cobertura da Atenção Básica [Internet]. 2021 [cited on Jun 12, 2022]. Available from: https://egestorab.saude.gov.br/paginas/acessoPublico/relatorios/relHistoricoCoberturaAB.xhtml

20. Pinheiro PC, Barros MBA, Szwarcwald CL, Machado ÍE, Malta DC. Diferenças entre medidas autorreferidas e laboratoriais de diabetes, doença renal crônica e hipercolesterolemia. Ciênc Saúde Coletiva 2021; 26(4): 1207-9. https://doi.org/10.1590/1413-81232021264.44582020

21. Cobo B, Cruz C, Dick PC. Gender and racial inequalities in the access to and the use of Brazilian health services. Cien Saude Colet 2021; 26(9): 4021-32. https://doi.org/10.1590/1413-81232021269.05732021

22. Szwarcwald CL, Stopa SR, Damacena GN, Almeida WDS, Souza Júnior PRB, Vieira MLFP, et al. Changes in the pattern of health services use in Brazil between 2013 and 2019. Cien Saude Colet 2021; 26(Supl 1): 2515-28. https://doi.org/10.1590/1413-81232021266.1.43482020

23. Ho ISS, Azcoaga-Lorenzo A, Akbari A, Davies J, Hodgins P, Khunti K, et al. Variation in the estimated prevalence of multimorbidity: systematic review and meta-analysis of 193 international studies. BMJ Open 2022; 12(4): e057017. https://doi.org/10.1136/bmjopen-2021-057017

24. Sakib MN, Shooshtari S, St John P, Menec V. The prevalence of multimorbidity and associations with lifestyle factors among middle-aged Canadians: an analysis of Canadian Longitudinal Study on Aging data. BMC Public Health 2019; 19(1): 243. https://doi.org/10.1186/s12889-019-6567-x

25. Sim SZ, Koh HL, Lee SPS, Young DYL, Lee ES. How does multimorbidity affect middle-aged adults? A cross-sectional survey in the Singapore primary healthcare setting. BMC Fam Pract 2020; 21(1): 190. https://doi.org/10.1186/s12875-020-01262-2

26. Bowling A, Dieppe P. What is successful ageing and who should define it? BMJ 2005; 331(7531): 1548-51. https://doi.org/10.1136/bmj.331.7531.1548

27. Gallardo AR, Pacelli B, Alesina M, Serrone D, Iacutone G, Faggiano F, et al. Medium- and long-term health effects of earthquakes in high-income countries: a systematic review and meta-analysis. Int J Epidemiol 2018; 47(4): 1317-32. https://doi.org/10.1093/ije/dyy130

28. Beaglehole B, Mulder RT, Frampton CM, Boden JM, Newton-Howes G, Bell CJ. Psychological distress and psychiatric disorder after natural disasters: systematic review and meta-analysis. Br J Psychiatry 2018; 213(6): 716-22. https://doi.org/10.1192/bjp.2018.210

RESUMO

Objetivo: Avaliar a prevalência de multimorbidade e os fatores sociodemográficos e de área de residência associados a essa condição entre adultos residentes em Brumadinho, Minas Gerais. **Métodos:** Estudo transversal realizado a partir dos dados da linha de base do Projeto Saúde Brumadinho, que foi conduzida no ano de 2021 e incluiu 2.777 indivíduos com 18 anos ou mais. A variável desfecho foi a multimorbidade, definida pela existência de duas ou mais entre 20 doenças crônicas. As variáveis exploratórias foram sexo, faixa etária, escolaridade, cor da pele e área de residência. A associação entre as variáveis exploratórias e a multimorbidade foi avaliada pela regressão logística. **Resultados:** A prevalência de multimorbidade foi de 53,8% (IC95% 50,6–56,9). Maior chance de multimorbidade foi encontrada entre as mulheres ($OR_{ajustado}$=2,5; IC95% 1,9–3,2), nos participantes com idade entre 40 e 59 ($OR_{ajustado}$= 2,8; IC95% 1,8–4,3) ou com 60 anos ou mais ($OR_{ajustado}$= 7,9; IC95% 4,7–13,4) e nos residentes em áreas que foram diretamente atingidas pelo rompimento da barragem ($OR_{ajustado}$=1,6; IC95% 1,3–2,0). **Conclusão:** A elevada carga de multimorbidade sobre a população de Brumadinho requer medidas preventivas eficazes e ações no âmbito populacional, mas principalmente entre aqueles grupos mais vulneráveis, ou seja, mulheres, indivíduos de meia-idade e idosos bem como aqueles diretamente atingidos pelo rompimento da barragem, além de oferta oportuna de cuidados de saúde, de modo a reverter esse quadro apresentado.

Palavras-chave: Multimorbidade. Doença crônica. Desastres provocados pelo homem. Fatores socioeconômicos. Mineração. Coorte.