ORIGINAL ARTICLE

Prevalence of psychiatric symptoms and associated factors in the adult population from the area affected by the tailings dam rupture – Brumadinho Health Project

Prevalência de sintomas psiquiátricos e seus fatores associados na população adulta da área atingida pelo rompimento da barragem de rejeitos: Projeto Saúde Brumadinho

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ABSTRACT

Objective: To examine the prevalence of psychiatric symptoms and associated factors in the adult population of Brumadinho (MG), after the dam collapse. **Methods:** We included 2,740 participants with information about symptoms of post-traumatic stress disorder (PTSD), depression, anxiety, thoughts of death/self-harm, and poor sleep quality collected in 2021. Prevalence values of all conditions were estimated to compare the prevalence of psychiatric symptoms with the participants' sociodemographic characteristics and place of residence. Pearson's c2 test was used, with Rao Scott's correction. Crude and adjusted logistic regressions estimated odds ratios and 95% confidence intervals to assess the association between psychiatric symptoms and participants' characteristics. **Results:** The most common condition was depressive symptoms (29.3%), followed by post-traumatic stress symptoms (22.9%) and anxious symptoms (18.9%). Regarding the association between participants' characteristics in the adjusted analysis, being a female and living in a mining area was positively associated with symptoms of PTSD, depression, anxiety, thoughts of death/self-harm, and poor sleep quality. A positive association was also found between high school education and post-traumatic stress symptoms. In contrast a negative association was found between being aged ≥60 years and symptoms of PTSD, depression, and anxiety. **Conclusion:** High prevalence values were found for all psychiatric symptoms after the dam failure in Brumadinho. Being a female, living in the mining area, being ≥60 years old, and having an educational level were all associated with the psychiatric symptoms investigated.

Keywords: Technological disasters. Structure collapse. Prevalence. Psychiatric symptoms. Associated factors.

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CONFLICT OF INTERESTS: nothing to declare.

INTRODUCTION

Disaster is defined as a severe interruption of the functioning of a community or society on any scale due to dangerous events that interact with conditions of exposure, vulnerability, and capacity, causing human, material, economic or environmental losses. The term disaster is generally replaced by the word emergency when there are biological or technological risks or conditions that cause severe damage to health[1].

In the last 20 years, 7,348 disasters have been recorded, causing the death of approximately 1.23 million people and affecting more than 4 billion individuals. China and India were the most affected nations in this period, while Brazil ranked 10th[2]. Disasters have different causes and can be classified as natural or technological, determining the emergence of different psychopathological profiles[3-7].

Since the 20th century, technological disasters (TDs), a malfunction of a technological structure or human error in technology control or handling[8], have led to a significant increase in people being exposed to traumatic situations[9]. In addition, evidence shows that exposure to TDs is associated with high prevalence of different psychiatric conditions[10-13].

In January 2019, a new TD took place in Minas Gerais with the rupture of a dam run by the company Vale S/A in Brumadinho. This rupture was considered the most significant work accident ever recorded in Brazil and the second biggest industrial disaster of the 21st century[14]. According to Noal et al.[15], the magnitude of the disaster, the number of deaths and missing persons, the destruction of homes and public spaces, in addition to the direct and indirect exposure of the population to mud, water, and dust contaminated by heavy metals, and the destruction of the ecosystem (contamination of the Paraopeba River) were important negative impact factors on the mental health of survivors.

However, studies with a representative sample of the population of Brumadinho to verify the burden of mental problems have not yet been carried out. This knowledge will help us understand how these problems are distributed in the municipality and support the planning of systematic actions to monitor this population. Therefore, the present study was carried out with participants aged ≥18 years from the baseline sample of the Brumadinho Health Project[16], and the prevalence of psychiatric symptoms and associated factors were assessed.

METHODS

Source of Data

Brumadinho Health Project is a population-based cohort study designed to represent the city's population in a particular age group (≥12 years). It aims to produce information on health-related conditions of the population residing in the municipality to help the health service to provide better care to residents. The baseline sample was built in 2021[16], and the interviews were done between June and December.

The Research Ethics Committee of Fiocruz Minas approved the Brumadinho Health Project (20814719.5.0000.5091), and all participants signed the Informed Consent Form and/or the Informed Assent Term of the underage, accompanied by an informed consent signed by their caregivers/guardians.

The sampling plan considered three estimation domains:
1. Region directly affected by the failure of the tailings dam at the Córrego do Feijão mine (MG), including communities that had contact with tailings mud or river water contaminated by tailings;
2. People who lived in a mining activity area;
3. Region not directly affected by the dam failure or mining activity.

These domains were defined by grouping census sectors based on the Brazilian Institute of Geography and Statistics (IBGE) data from 2019.

All households in the regions considered affected by the tailings mud or mining activity (census) were included, as well as a random sample of households in regions considered not directly affected by the event. Residents of selected households were enrolled in all domains, and those aged ≥12 years at the time of the home visits were invited to the study. More details can be found on the project website (http://www.minas.fiocruz.br/saudebrumadinho/), in the article on its methodology[16]. For this analysis, participants aged ≥18 years were included.

Psychiatric Symptoms

The outcomes of this study included psychiatric symptoms assessed through the application of screening scales for symptoms of post-traumatic stress disorder (PTSD), depressive disorder, and anxiety disorder. Presence of suicidal and self-mutilation ideas and worsening of sleep quality were also evaluated through self-reported information.

Post-traumatic stress symptoms (PTSD) were assessed using the Post-Traumatic Stress Disorder Checklist — Civilian Version (PCL-C)[17]. The PCL-C was developed for the general population and is not related to a specific traumatic event. It helps one obtain information on PTSD indicators and post-traumatic symptoms. It is a self-report instrument with 17 items based on the criteria of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV)[18]. Respondents choose the items that disturbed them in the last month and classified them on a Likert scale, where 1 means nothing and 5 a lot. The instrument assessment can be performed by an algorithm[19] or global score (cut-off point)[17]. Its semantic equivalence to Brazil was evaluated by Berger et al.[20]. The validation was performed by Bringhenti et al.[21], with individuals

who had been injured in traffic accidents. In this validation, the PCL-C was transformed in a Likert scale of 10 rather than 5 items, like the original[17]. The adoption of the PCL-C algorithm was chosen for the analysis. In this method, the presence of PTSD was considered when the score was ≥3 for at least one item in questions 1 to 5 (Criterion B), three items in questions 6 to 12 (Criterion C), and two items in questions 13 to 17 (Criterion D)[19].

Depressive symptoms were estimated by the Patient Health Questionnaire-9 (PHQ-9)[22], a nine-question questionnaire that assesses the depressive symptoms described in the DSM-IV (depressed mood, anhedonia, sleep problems, tiredness or lack of energy, change in appetite or weight, feelings of guilt or worthlessness, problems with concentration, feeling sluggish or restless, and suicidal thoughts)[18]. Brazilian psychiatrists performed the translation of PHQ-9, and one of the authors of the original instrument performed its back-translation[23]. The frequency of each symptom in the last two weeks is evaluated on a 0 to 3 Likert scale, corresponding to the answers "never", "several days", "more than half of the days" and "almost every day", respectively. In the Brazilian version, the scale has an additional question that assesses the interference of depressive symptoms in the performance of daily activities. In this study, the validated cut-off point ≥9 was adopted[24].

Anxiety symptoms were assessed based on the General Anxiety Disorder-7 (GAD-7)[25], a brief instrument for assessing, diagnosing, and monitoring anxiety[25], validated according to the DSM-IV[26]. The GAD-7 is composed of seven items arranged on a four-point scale: 0 (never) to 3 (almost every day), with a score ranging from 0 to 21 for signs and symptoms of the last few weeks. This analysis considered the validated cut-off point ≥10[27-28].

Self-reported ideas of death and self-harm were obtained by means of the ninth question of the PHQ-9: "In the last two weeks, how many days have you thought about hurting yourself in some way or that it would be better to be dead?". The answer was selected on a Likert scale where 0 means "never"; 1, "less than a week"; 2, "a week or more"; and 3, "almost every day". For the analysis, response 0 was classified as absence of suicidal idea, while responses 1, 2 and 3 were related to the presence of suicidal thoughts.

Self-reported poor sleep quality is assessed in the questionnaire by the question: "How do you classify your sleep quality?". The answer uses a Likert scale where 0 is "excellent"; 1 is "good"; 2 is "regular"; 3 is "bad"; and 4 is "very bad". For the analysis, responses 0, 1, and 2 were coded as no complaints about sleep quality, while 3 and 4 as worsened sleep quality.

This study also considered the variables gender, age (18–59 years, 60 years or older), marital status [not married (single/divorced/widowed), married], self-reported skin color (white, black), education (no education, complete/incomplete elementary school, complete/incomplete high school, complete/incomplete higher education), and place of residence. In addition, the variable self-reported skin color was classified as dichotomous [white, black (brown/black)]. We made this choice because yellow and indigenous ethnic groups' frequency was 0.88 and 0.29%, respectively.

Statistical Analysis

Statistical analyses were made in the Stata 17 software. Due to the complex stratified design of the sample, the analyses were performed with weighting factors and correction for the sample design. The svy command was used in the evaluation. Initially, the prevalence of symptoms of PTSD, depression, anxiety, suicidal ideation, and worse sleep quality was estimated for the total sample. Then, Pearson's χ^2 test with Rao-Scott correction was used to compare the prevalence with the characteristics of the participants.

Finally, univariate and multivariate logistic regressions were used to estimate odds ratios (OR) and 95% confidence intervals (95%CI), which allowed us to assess the association of symptoms of PTSD, depression, anxiety, suicidal ideation and worse sleep quality with the participants' sociodemographic characteristics and place of residence.

Ethical Aspects

The Brumadinho Health Project was approved by the Research Ethics Committee of Fundação Oswaldo Cruz of Minas Gerais. All participants signed an informed consent form.

RESULTS

From the 3,080 baseline participants, 2,740 (88.9%) provided complete information regarding the variables included in this analysis. Participants had a mean age of 48.4 years (95%CI 47.2–49.6), were mostly female (56.7%), had no higher education (78.2%), and lived in areas that were not directly affected by the dam failure or had mining activities (95.3%). Other characteristics are shown in Table 1.

Prevalence of Psychiatric Symptoms

Table 2 shows the prevalence of psychiatric symptoms in the whole sample and by participants' characteristics. Depressive symptoms (29.3%) and PTSD (22.9%) had the highest prevalence values, while self-reported suicidal ideation or self-harm had the lowest values (12.6%).

For all psychiatric symptoms, the prevalence was statistically higher in women, ranging from 16.2% (95%CI 13.7–18.9) for suicidal ideation or self-harm to 37.1% (95%CI 33.8–40, 6) for depressive symptoms. Differences were seen in age groups, with higher prevalence among younger people, except for ideas of death and self-harm. Self-reported skin color was significantly associated with PTSD symp-

Table 1. Characteristics of the 2,740 participants of the Brumadinho Health Project sample (MG), Brazil, 2021*.

Characteristics	Percentage (%) (95%CI)
Sex	
Male	43.3 (41.1–45.6)
Female	56.7 (54.4–58.9)
Age (years)	
18–59	69.5 (66.2–72.6)
≥60	30.5 (27.4–33.8)
Mean	48.4 (47.2–49.6)
Marital status	
Not married	40.3 (37.1–43.5)
Married	59.7 (56.3–62.8)
Self-reported skin color	
White	42.3 (38.7–45.5)
Black	57.7 (54.1–60.1)
Education	
No study	2.4 (1.6–3.4)
Elementary school (complete or incomplete)	42.2 (39.5–44.9)
High School (complete or incomplete)	33.6 (30.7–36.7)
Higher Education (complete or incomplete) or more	21.8 (19.2–24.8)
Residence	
Sample from the rest of the municipality	95.3 (95–95.6)
Region directly affected	3 (2.8–3.2)
Mining activity area	1.7 (1.5–1.8)

*The analysis included only participants who provided information about all investigated variables; 95%CI: 95% confidence interval.

toms, with higher prevalence among black people. Educational level was significantly associated with symptoms of PTSD, depression and thoughts of death or self-harm. There were also statistically significant differences between the places of residence and all outcomes.

Crude and Adjusted Analyses

The crude analysis (supplementary table) showed a positive association between being a female and living in a mining activity area with all psychiatric symptoms. The OR values ranged from 2.09 (95%CI 1.61–2.75) for anxiety symptoms to 2.50 (95%CI 1.98–3.15) for depressive symptoms in females; and from 1.41 (95%CI 1.08–1.85) for self-reported worse sleep quality to 2.33 (95%CI 1.81–3.09) for anxiety symptoms in residents of mining areas.

On the other hand, participants who lived in the directly affected region showed a positive association for PTSD, depressive and anxious symptoms. Regarding age, being aged ≥60 was negatively associated with symptoms of PTSD, depression, anxiety, and self-reported poor sleep

quality. A positive association was found between self-reported non-white skin and having the complete elementary and high schools (OR=5.73; 95%CI 1.54–21.41) with PTSD symptoms.

The multivariate analysis (Table 3) showed female participants and residents of mining areas positively associated with all psychiatric symptoms. The OR values ranged from 2.27 (95%CI 1.71–3.01) for anxiety symptoms to 2.70 (95%CI 2.13–3.43) for depressive symptoms among females; and from 1.40 (95%CI 1.04–1.88) for self-reported worsening of sleep quality to 2.31 (95%CI 1.73–3.09) for anxiety symptoms among residents of mining areas.

Similarly, residents of the directly affected area maintained a positive association with symptoms of PTSD (OR=1.44; 95%CI 1.12–1.82), depression (OR=1.36; 95%CI 1.08– 1.72), and anxiety (OR=1.48; 95%CI 1.14–1.91). On the other hand, participants aged ≥60 years showed a persistent negative association with symptoms of PTSD (OR=0.56; 95%CI 0.38–0.81), depression (OR=0.68; CI95 % 0.49–0.94) and anxiety (OR=0.46; 95%CI 0.31–0.68). Finally, as for the educational level, only complete high school was associated with PTSD symptoms (OR=4.33; 95%CI 1.13–16.6).

DISCUSSION

This study selected a sample representative of the population aged ≥18 years in Brumadinho and showed high prevalence values for all investigated psychiatric symptoms. Depressive symptoms was the most prevalent condition (29.3%). On the other hand, the prevalence of symptoms of PTSD and anxiety was 22.9 and 18.9%, respectively. Finally, there was a positive association between being a female residing in mining activity areas, and presenting with symptoms of PTSD, depression, anxiety, ideas of death/self-harm, and worse sleep quality. Furthermore, high school education and PTSD symptoms were positively associated, while being ≥60 years old and symptoms of PTSD, depression, and anxiety were negatively associated.

The prevalence of different psychiatric symptoms in Brumadinho is higher than that observed in the Brazilian population[29] and consistent with the literature, which demonstrates the negative impact of disasters on survivors' mental health[10-12]. The prevalence of PTSD symptoms was 22.9%. This estimate is lower than the one described in a review on PTSD epidemiology after TDs (30–60%)[30]. However, the prevalences of the aforementioned epidemiological study were estimated within the first year after the disasters, while our rates were obtained two years after. In any case, the prevalence of PTSD symptoms found in Brumadinho was higher than the values reported after two years of the Mariana dam failure (MG)[12].

Depression is one of the most common psychiatric disorders. Its prevalence is usually only lower than PTSD

Table 2. Prevalence of symptoms of post-traumatic stress, depression, anxiety, thoughts of death or self-harm, and worse sleep quality by sex, age, marital status, self-reported skin color, educational level and place of residence. Brumadinho Health Project (MG), Brazil, 2021.

Characteristics	Prevalence (%) (95%CI)				
	Symptoms of post-traumatic stress	Depression symptoms	Anxiety symptoms	Thoughts of death	Worse sleep quality
Total	22.9 (20.3–25.8)	29.3 (26.8–32.0)	18.9 (16.7–21.4)	12.6 (10.8–14.7)	18.6 (16.5–20.9)
Sex					
Male	15.4 (12.5–18.7)	19.1 (16.1–22.4)	12.8 (10.3–15.6)	8.0 (6.1–10.4)	11.6 (9.2–14.5)
Female	28.7 (25.2–32.5)	37.1 (33.8–40.6)	23.6 (20.7–26.8)	16.2 (13.7–18.9)	23.9 (20.9–27.3)
	p<0.0001	**p<0.0001**	**p<0.0001**	**p<0.0001**	**p<0.0001**
Age (years)					
18–59	26.7 (11.5–19.2)	32.0 (28.6–35.6)	22.3 (19.5–25.5)	13.3 (11.0–16.0)	20.9 (18.3–23.9)
≥60	14.9 (11.5–19.2)	23.5 (26.8–32.0)	11.9 (8.8–15.9)	10.7 (7.8–14.5)	15.4 (11.9–19.7)
	p<0.00001	**p=0.0071**	**p=0.0001**	p=0.2561	**p=0.0335**
Marital status					
Not married	23.6 (19.9–27.7)	31.9 (27.8–36.1)	18.8 (16.6–22.5)	13.4 (10.9–16.4)	19.4 (16.3–22.9)
Married	22.8 (19.3–26.9)	27.8 (24.5–31.5)	19.5 (16.6–22.8)	11.9 (9.4–15.0)	19.2 (16.4–22.4)
	p=0.7091	p=0.1454	p=0.7507	p=0.5636	p=0.6733
Self-reported skin color					
White	18.9 (15.6–22.5)	26.5 (22.6–30.7)	16.9 (13.9–20.5)	10.5 (8.1–13.4)	16.4 (13.3–20.2)
Black	25.8 (22.2–29.3)	31.2 (27.8–34.9)	20.3 (17.3–23.7)	14.2 (11.6–17.4)	20.1 (17.5–23.0)
	p=0.0148	p=0.1004	p=0.2027	p=0.0978	p=0.1620
Education					
No study	6.5 (1.9–20.0)	29.4 (15.2–49.2)	20.1 (8.5–40.5)	13.3 (4.8–31.9)	13.3 (5.4–29.3)
Elementary school (complete or incomplete)	22.4 (18.9–26.3)	30.7 (26.9–34.7)	18.5 (15.3–22.2)	15.8 (13.0–19.1)	18.4 (15.4–21.9)
High School (complete or incomplete)	28.6 (23.5–34.2)	33.2 (28.2–38.5)	21.2 (17.3–25.7)	11.9 (8.9–15.9)	22.3 (18.5–26.6)
Higher Education (complete or incomplete) or more	17.6 (13.1–23.2)	20.9 (16.1–26.7)	17.0 (12.3–22.9)	6.7 (4.2–10.6)	16.6 (12.2–22.2)
	p=0.0021	**p=0.0093**	p=0.6212	**p=0.0047**	p=0.2195
Residence					
Sample from the rest of the municipality	22.5 (19.7–22.5)	28.9 (26.2–31.7)	18.5 (16.2–21.1)	12.4 (10.5–14.6)	18.4 (16.2–20.8)
Region directly affected	29.7 (26.7–32.8)	35.4 (32.0–38.9)	24.3 (21.4–27.4)	14.7 (12.3–17.6)	21.8 (19.3–24.5)
Mining activity area	35.7 (31.4–40.3)	42.8 (38.2–47.5)	34.7 (30.5–39.1)	23.8 (19.8–28.2)	24.2 (20.4–28.5)
	p<0.0001	**p<0.0001**	**p<0.0001**	**p<0.0001**	**p=0.0094**

p-values were estimated by Pearson's χ^2 test with Rao Scott correction; 95%CI: 95% confidence interval; values in bold are significant: p≤0.05

in studies on the impact of disasters on the population, but it may rank first among psychiatric disorders in places where its prevalence is high. Although there are no studies about the prevalence of depression in Brumadinho, a recent article reported that Brazilian rates are among the highest[31], which explains why depressive symptoms ranked first here.

Some studies, although very few, have investigated the prevalence of other psychiatric symptoms and have shown a high prevalence of generalized anxiety disorders[11,12], sui-cide risk[12,32], and sleep disorders[12,33]. Our study's findings agree with the literature: high prevalence of anxiety symptoms, ideas of death and self-harm, and self-reported poor sleep quality.

Regardless of their etiology, what disasters have in common is the negative impact on the physical and mental health of survivors[11,34]. Therefore, different studies investigate the prevalence of psychiatric disorders after different disasters[35-38]. However, significant variations in prevalence may stem from different degrees of expo-

Table 3. Adjusted logistic regression of symptoms of post-traumatic stress disorder, depression, anxiety, self-reported thoughts of death/self-harm and worse sleep quality among participants of the Brumadinho Health Project (MG), Brazil, 2021*.

Characteristics	Symptoms of post-traumatic stress Adjusted OR (95%CI)	Depression symptoms Adjusted OR (95%CI)	Anxiety symptoms Adjusted OR (95%CI)	Thoughts of death Adjusted OR (95%CI)	Worse sleep quality Adjusted OR (95%CI)
Sex					
Male	1	1	1	1	1
Female	**2.52 (1.90–3.33)**	**2.70 (2.13–3.43)**	**2.27 (1.71–3.01)**	**2.28 (1.66–3.13)**	**2.38 (1.73–3.27)**
Age (years)					
18–59	1	1	1	1	1
≥60	**0.56 (0.38–0.81)**	**0.68 (0.49–0.94)**	**0.46 (0.31–0.68)**	0.76 (0.49–1.17)	0.76 (0.52–1.11)
Marital status					
Not married	1	1	1	1	1
Married	1.03 (0.76–1.40)	0.89 (0.68–1.16)	1.13 (0.83–1.54)	0.92 (0.65–1.42)	1.07 (0.80–1.43)
Self-reported skin color					
White	1	1	1	1	1
Black	1.33 (0.97–1.84)	1.10 (0.83–1.47)	1.13 (0.83–1.57)	1.35 (0.92–1.98)	1.29 (0.93–1.78)
Education					
No study	1	1	1	1	1
Elementary school	3.67 (0.96–13.99)	1.06 (0.42–2.65)	0.70 (0.23–2.13)	1.18 (0.36–3.84)	1.37 (0.48–2.89)
High School	**4.33 (1.13–16.6)**	1.03 (0.40–2.68)	0.68 (0.22–2.16)	0.76 (0.22–2.60)	1.59 (0.54–4.63)
Higher Education	2.74 (0.71–10.58)	0.59 (0.23–1.53)	0.63 (0.19–2.03)	0.45 (0.12–1.61)	1.21 (0.41–3.59)
Residence					
Sample from the rest of the municipality	1	1	1	1	1
Region directly affected	**1.44 (1.12–1.82)**	**1.36 (1.08–1.72)**	**1.48 (1.14–1.91)**	1.20 (0.87–1.65)	1.23 (0.97–1.55)
Mining activity area	**1.81 (1.36–2.41)**	**1.78 (1.36–2.34)**	**2.31 (1.73–3.09)**	**1.98 (1.41–2.78)**	**1.40 (1.04–1.88)**

OR: odds ratio; 95%CI: 95% confidence interval; values in bold are significant p≤0.05.

sure, types of disasters, definition of cases, and populations studied.

The degree of exposure to a disaster is probably the most significant predictor of psychiatric symptoms[1,7-10]. Therefore, survivors who were on-scene during the disaster were more likely to develop psychiatric symptoms than those who were indirectly affected. In addition, evidence suggests that TDs have a more significant negative impact on mental health than natural disasters[4].

Concerning case definition, screening scales determine prevalence higher than in structured or semi-structured clinical interviews applied by laypersons or certified professionals[39]. Finally, the elderly are at lower risk of developing symptoms of PTSD, depression, and substance abuse[35,36]. At the same time, middle-aged adults are more likely to develop psychiatric symptoms as they experience more significant stress and responsibilities in life[11,35].

Finally, it is essential to emphasize that data collection occurred in 2021, during the COVID-19 pandemic. In this period, studies from different countries[40-44], including Brazil[45-47], showed high rates of psychiatric disorders due to social distancing measures. Thus, the high prevalence of psychiatric symptoms in Brumadinho can be the result of negative impact on the mental health of residents not only because of the dam failure, but also because of the pandemic.

As to sociodemographic variables, previous studies have shown that some of them are associated with psychiatric symptoms[11,48,49]. Being a female is the most consistent factor for the appearance of different psychiatric disorders[48,49], as reported in this study. Although the mechanism responsible for the difference in psychiatric symptoms between men and women is not fully understood, some conditions contribute to this inequality. Among the main factors, the type of disaster and the numerous differences between men's and women's biological/physiological functions[50,51], the ability to overcome stressful situations[52] and social support[53,54] stand out.

Recently, socioeconomic variables such as educational level have been used to assess the impact of disasters in the short and long terms[55]. For example, individuals with lower educational levels are more likely to live in areas affected by disasters, lose their homes and stay in shelters or temporary housing. On the other hand, those with higher education have more opportunities, are healthier, receive better wages, have higher life expectancies, and live in less affected areas[56].

Regarding age, a negative association was observed between being aged ≥60 years and symptoms of PTSD, depression, and anxiety, which is explained by better-coping skills to adverse situations and traumatic events that this group acquired throughout life[57], or the greater resilience of the elderly in accepting and adapting to adverse changes in life[58].Lastly, living in a mining area probably represents a greater chance of exposure to a new dam failure, as participants of these regions have a more consistent association with psychiatric symptoms than the population directly affected by the disaster.

Our study has the following advantages: inclusion of a sample representative of the municipality; high response rate; investigation of different psychiatric symptoms using standardized and validated instruments; differentiation of prevalence values and association with psychiatric symptoms according to the participants' area of residence; and intensive training of field and laboratory teams.

Limitations should also be mentioned, including the absence of important information that would guarantee a more accurate and less speculative interpretation of results. As an example, we can cite the lack of previous information about the prevalence of psychiatric symptoms in a given period, which prevents the evaluation of variations over time and the impact of specific situations such as the economic crisis (2016), the dam collapse (2019) and the COVID-19 pandemic (2020/2021) on the mental health of Brumadinho residents. Furthermore, the study's cross-sectional design is also a limitation; it makes it impossible to establish causal relationships as they do not prove the existence of a temporal sequence between sociodemographic characteristics, place of residence, and subsequent development of psychiatric symptoms.

Our study shows a high prevalence of different psychiatric symptoms after the Brumadinho dam disaster. There was a positive association between being a female and living close to a mining area and symptoms of PTSD, depression, anxiety, ideas of death/self-harm and worse sleep quality. There was also a positive association between educational level and PTSD symptoms, and a negative association between being aged ≥60 years and symptoms of PTSD, depression, and anxiety. The investigation of other factors associated with psychiatric symptoms after the Brumadinho dam failure will improve the understanding of the complex relationship between this event and the mental health of the population.

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RESUMO

Objetivo: Examinar a prevalência dos sintomas psiquiátricos e seus fatores associados na população adulta de Brumadinho (MG), após o rompimento da barragem. **Métodos:** Foram incluídos 2.740 participantes com informações coletadas em 2021 sobre os sintomas de estresse pós-traumático (TEPT), depressão, ansiedade, ideias de morte/automutilação e pior qualidade do sono. Estimaram-se as prevalências de todas as condições. Para a comparação das prevalências dos sintomas psiquiátricos e as características sociodemográficas e local de moradia, empregou-se o teste χ^2 de Pearson, com correção de Rao-Scott. Regressões logísticas brutas e ajustadas estimaram os *odds ratios* e intervalos de confiança de 95%, permitindo a avaliação da associação entre os sintomas psiquiátricos e as características dos participantes. **Resultados:** Os sintomas depressivos foram a condição mais prevalente (29,3%), seguidos pelos sintomas de TEPT (22,9%) e sintomas ansiosos (18,9%). Com relação à investigação da associação entre as características dos participantes na análise ajustada, observou-se que o sexo feminino e os moradores da área de mineração apresentaram relação positiva com os sintomas de TEPT, depressivos, ansiosos, ideia de morte e pior qualidade de sono. Também se encontraram associação positiva entre a escolaridade de nível médio e os sintomas de TEPT e associação negativa entre aqueles com ≥60 anos e os sintomas de TEPT, depressivos e ansiosos.

Conclusão: Altas prevalências foram encontradas para todos os sintomas psiquiátricos após a ruptura da barragem em Brumadinho. Sexo feminino, local de moradia na área de mineração, ≥60 anos e escolaridade foram associados aos sintomas psiquiátricos investigados.

Palavras-chave: Desastres tecnológicos. Colapso estrutural. Prevalência. Sintomas psiquiátricos. Fatores associados.