

Factors associated with suicidal ideation during the COVID-19 pandemic in a population in the Brazilian Legal Amazon

Fatores associados a ideação suicida durante a pandemia da COVID-19 em população da Amazônia Legal Brasileira

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Abstract *This article aims to analyze the factors associated with suicidal ideation in the COVID-19 pandemic. A cross-sectional home-based survey, with three-stage cluster sampling, was conducted with 4,203 adults from ten municipalities in the Mato Grosso, Brazil. The data collection was carried out in households to assess the use and behavior in the pandemic. The Level 1 Symptom Cross Scale was used to identify suicidal ideation and aspects of mental health (somatic symptoms, sleep disturbances, dissociation, depression, anger, mania, anxiety, thoughts, substance use and memory). Chemiluminescence was used to detect IgG anti-SARS-CoV-2 antibodies. The prevalence of suicidal ideation was 19.2%, and the associated with increased consumption of alcohol (RP=1.16), smoking (RP=1.30), COVID-19 symptoms (RP=1.03), having one's life affected (RP=1.04), mental illness (RP=1.09) somatic symptoms (RP=1.15), sleep disturbance (RP=1.30), dissociation (RP=1.24), depression (RP=1.24), anger (RP=1.11), anxiety (RP=1.26), substance use (RP=1.19), drug prescription use (RP=1.18) and memory (RP=1.87). Highlights the high prevalence of suicidal ideation related to COVID-19 symptoms, changes in behavior post-pandemic and mental health factors.*

Key words SARS-CoV-2, Epidemiological surveys, Mental health, Suicidal ideation

Resumo *O objetivo deste artigo é analisar fatores associados a ideação suicida durante a pandemia da COVID-19. Inquérito de base populacional conduzido com 4.203 adultos de dez municípios mato-grossenses, Brasil. A coleta de dados foi realizada no domicílio, com avaliação de características sociodemográficas, uso de substâncias e comportamentos durante a pandemia. A Escala Transversal de Sintomas de Nível 1 do DSM-5 foi utilizada na identificação dos aspectos da saúde mental (sintomas somáticos, distúrbios do sono, dissociação, depressão, raiva, mania, ansiedade, pensamentos, uso de substâncias e memória) e utilizou-se quimioluminescência para detecção de anticorpos IgG anti-SARS-CoV-2. A prevalência de ideação suicida foi de 19,2%, e associou-se ao aumento do consumo de álcool (RP=1,16) e tabagismo (RP=1,30), sintomas de COVID-19 (RP=1,03), ter a vida muito afetada (RP=1,04), doença mental (RP=1,09), sintomas somáticos (RP=1,15), distúrbio do sono (RP=1,30), dissociação (RP=1,24), depressão (RP=1,24), raiva (RP=1,11), ansiedade (RP=1,26), uso de substâncias (RP=1,19), uso de medicamentos (RP=1,18) e memória (RP=1,87). Destacou-se a alta prevalência de ideação suicida e sua associação à sintomas de COVID-19, mudanças de comportamento pós-pandemia e fatores de saúde mental.*

Palavras-chave SARS-CoV-2, Inquéritos epidemiológicos, Saúde mental, Ideação suicida

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Introduction

With the advent and rapid expansion of the new coronavirus (SARS-CoV-2) worldwide¹, social isolation measures were adopted, and they proved to be highly effective in controlling viral spread². However, the mental health of the population, which before the pandemic was already impacted in a multifactorial way, with emphasis on factors inherent to the individual and the other biopsychosocial dimensions had negative repercussions due to the long periods of social isolation^{3,4}.

There was a negative effect on the quality of the population's mental well-being, an increase in the levels of anxiety, depression and alcohol abuse⁵, and an increase in cases of depression⁵⁻⁸, anxiety⁵⁻⁸, stress⁶⁻⁸, panic disorder³, insomnia⁸, fear^{4,7,8} and anger⁵ in different populations. The financial losses in this pandemic episode were an additional factor to the psychosocial risk^{9,10}; in particular, suicide rates increased in proportion to a rise in unemployment in Canada¹¹, a relationship already described in Brazil in the pre-pandemic period¹².

Suicidal behaviour is a complex phenomenon and involves different aspects that include planning and carrying out the suicide attempt¹³ and also suicidal ideation, which is characterized by passing thoughts or permeated by detailed plans on how to take one's own life.

It is evident that before the COVID-19 pandemic, suicide was already considered to be an impacting health problem, accounting for 1.4% of premature deaths worldwide^{14,15} in 2019, the rate of suicide deaths in the world was 9/100,000, while in Brazil it reached 6.4/100,000¹⁶ and Mato Grosso 7.9/100,000¹⁷. During the pandemic, a meta-analysis with 308,596 participants from 54 international surveys¹⁸ identified high rates of suicidal ideation (10.8%), which indicates an important risk for the occurrence of suicide.

A study conducted in the first weeks of social distance in April 2020, suggested that suicidal ideation remained stable in the American population¹⁹. However, in the subsequent months, there was a tendency for an increase in suicidal ideation, and it was in those in social isolation²⁰.

There are still many factors to be unveiled about suicidal ideation in Brazil during the pandemic, especially in the Legal Amazon region, whose geographic conditions have particular effects on the organization of the health care network and the distribution of resources, these were neglected in the pre-pandemic period and

with the increase in demand tends to worsen the scenario. In addition, there are no population-based studies in the region that investigate mental health. In this context, this study aimed to analyze the factors associated with suicidal ideation in the COVID-19 pandemic in a population of the Brazilian Legal Amazon.

Methods

A cross-sectional home-based survey was carried out in the state of Mato Grosso, in the Brazilian Legal Amazon region, namely Cuiabá, Várzea Grande, Cáceres, Rondonópolis, Barra do Garças, Tangará da Serra, Alta Floresta, Água Boa, Juína and Sinop (Figure 1). These municipalities are considered to be hubs, owing to their urban structure and intensity of flows of people in the existing health networks. They are cities whose population varies from 30,000 to 600,000 inhabitants, located in 3 of the main Brazilian biomes (Cerrado [5 cities], Pantanal [1 city] and Amazonia [3 cities]). Except for 2 cities that make up the metropolitan region of the capital Cuiabá, where the service sector is the main economic source, from 0.0 to 1.0 of the FIRJAN Municipal Development Index, a national index that considers the dimensions "employment and income", "education" and "health"²¹. The main connections of regional integration are also considered, and it was possibly based on them that the hierarchical diffusion process of COVID-19 occurred in this region²². This study integrates the matrix project "Endemic and epidemic diseases in Mato Grosso".

This study used a probabilistic design with three-stage cluster sampling: census sector (selected with probability proportional to the number of permanent households according to 2010 census data); household (selected from a systematic sampling); resident over the age of 18 (one randomly selected resident). The sample was estimated at 4,530 individuals, proportionally distributed according to the population size of the municipalities (25,000 to 65,000 inhabitants; 65,000 to 150,000; 150,000 to 300,000; >300,000).

Sample calculation was performed using the 2019 population estimate for the 10 selected municipalities (sample space: 1,650,643 inhabitants in the 10 municipalities in the study), considering a confidence level of 95%, design effect equal to 1.5, the prevalence of 3%²³ and accuracy of 0.65%. The sample size was calculated using OpenEpi²⁴. A percentage of 13% of recomposition was added to the sample size, considering

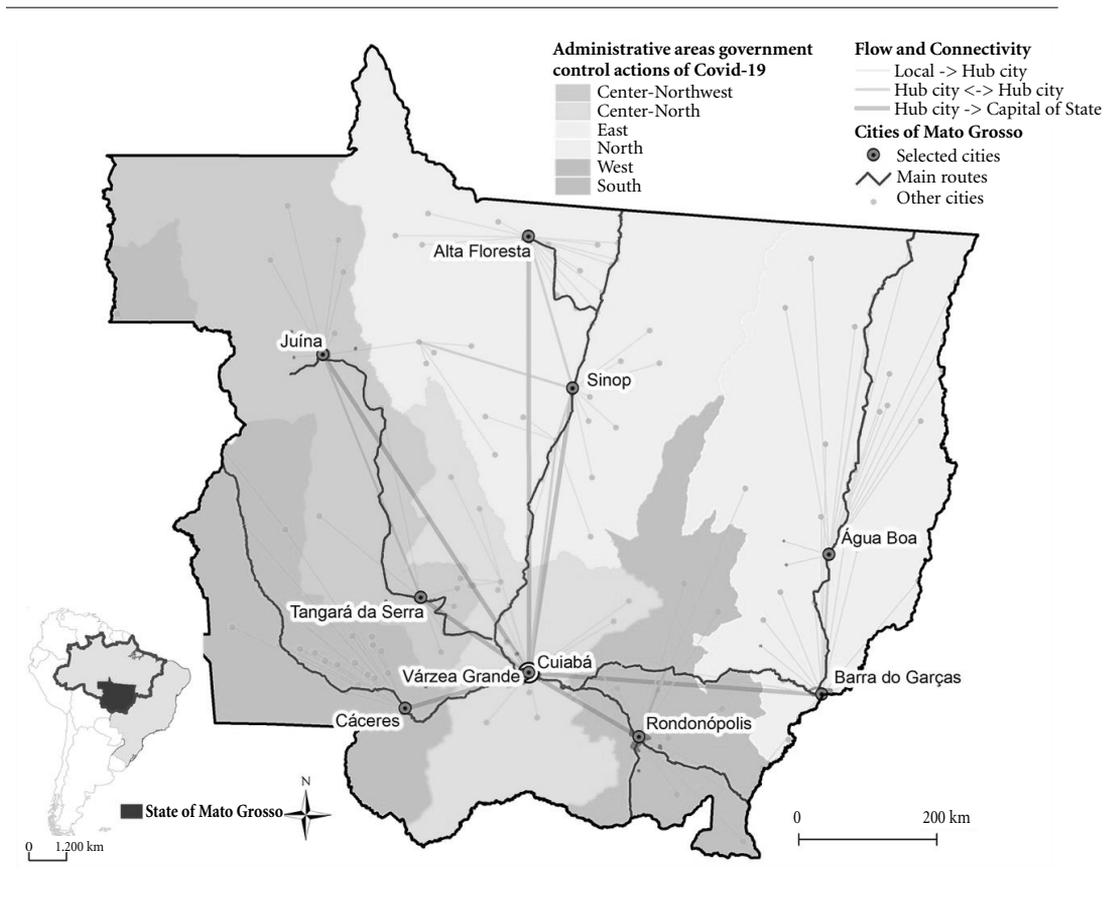


Figure 1. Location of the ten Mato Grosso municipalities surveyed, 2020.

Source: Authors.

the anticipated losses arising from refusals and the existence of closed households during the visit. The sampling weight of each selected unit (census sector, household and individual) was calculated separately for each municipality, considering the inverse of the probability of selection according to the proposed sampling plan, and including calibrations for adjustments to known population totals. Medium-sized municipalities, census sectors in urban areas and residents over 18 years of age were included and were excluded municipalities with less than 25,000 inhabitants, census sectors that encompassed rural areas and indigenous reserves and unconscious bedridden residents.

Data collection took place between September and October 2020 by professionals and students of health degree. Previous training was given in August 2020 to standardize the interviews,

blood collection and conduction of a pilot test. The pilot test was carried out in a census sector not selected for sampling, and its data were not included in the analysis. During data collection, the selected census sector was covered following a systematic approach for selecting households by “jumps” determined for each sector. If the selected household was currently empty or the selected resident did not agree to participate in the survey, the next box on the left was taken as a replacement.

At home, a resident over 18 years of age was randomly selected to answer the questionnaires, which was applied through Epi Info™ on Smartphones, which was also used to capture geographic coordinates. Fieldwork was carried out by a coordinator in each selected municipality.

The instrument applied in the individual interview included (i) sociodemographic data, (ii)

behavioral information, and (iii) the assessment of mental health (DSM-5).

(i) The sociodemographic data included simple questions about gender (female and male), age group (18-19, 30-49, 50-59 and ≥ 60), race/skin color (indigenous, black, yellow, brown and white), schooling (illiterate, elementary school, high school and undergraduate) and family income (<1 minimum wage (MW), 1-3 and >3MW) (family income was assessed considering R\$ 1,045 or US\$ 183,91).

(ii) Substances use after the onset of the pandemic – that involved question about increased alcohol and smoking consumption after the onset of the pandemic (yes or no), frequency of weekly alcohol consumption (nearly every day, more than half the days, several days and rare, less than a day two).

(iii) Data were collected on the behavioral in the experience of the COVID-19 pandemic, work at the onset of the pandemic (yes or no), how much has your life been affected by the pandemic (very affected, affected but still feels good most of the time, neutral and unaffected), COVID-19 self-reported symptoms (yes or no).

(iv) Presence of antibodies against SARS-CoV-2 confirmed by chemoimmunofluorescence. Biological samples were collected at home and later transported to the municipality's laboratory for cryopreserved at -20° and transported to the Central Public Health Laboratory of Mato Grosso (LACEN-MT). The laboratory analysis was conducted using a commercial kit imported by Diasorin (MS Registry: 103.398.40-56), from the Liaison[®] under batch 354020 and validity 12/15/2020, through the quantitative determination of IgG antibodies against the S1 and S2 proteins of SARS-CoV-2, with the supplier's report of 97.4% sensitivity (percentage of positive hits) and 98.5% specificity (percentage of negative hits). The authors also performed an internal validation test, in addition to following the LACEN-MT biosafety protocols at all testing stages. The choice of this test was made after accessing the available commercial kits and performing internal testing to measure their quality. Results were coded positive or negative according to the test.

(v) The Level 1 Symptom Cross Scale of DSM-5²⁵ is an instrument developed by the American Psychiatric Association (APA), which assesses mental health symptoms. This scale has shown promise in informing clinical diagnostic evaluations and as a screening tool for research²⁶. The adult version contains 23 items with an answer of five-point scale (0= none or not at all; 1=

Rare, less than a day or two; 2= mild or several days; 3= moderate or more than half the days; and 4= severe or nearly every day) for assessment of 13 psychiatric domains. For the domains substance use, suicidal ideation and psychosis the scores are considered as very mild (1) mild (2), moderate (3), or severe (4) and only the score nothing (0) which is considered negative. All 13 mental health symptoms are the results of the DSM-5 domains and were evaluated by study participants. Subsequently, the score was recoded in negative (no or very mild symptoms) or positive (mild, moderate or severe) score, is considered as a predictor for the presence of depression, anger, mania, anxiety, somatic symptoms, sleep disturbance, and memory.

The DSM-5 scale proved to be clinically useful and with good reliability in the DSM-5 field trials that were conducted on adult clinical samples in the United States and Canada. In Brazil, the DSM-5 manual provides a translation of this instrument for use as screening and diagnostic evaluation²⁵. Because it is a self-administered scale, which allows the monitoring of changes in mental symptoms over time, and because it contributes to the diagnosis and significant impact on treatment, these were some of the motivations that led us to use this scale²⁵.

Statistical analysis

All analyses were performed using the Stata software version 14, particularly the “svy” module, which allows the addition of weighting factors and takes into account the complex design of the sample.

The suicidal ideation variable was considered as a dependent variable and all sociodemographic variables (gender, age, race, schooling and family income), substance use after the onset of the pandemic, behaviors experienced during the COVID-19 pandemic period, and mental health (DSM-5 domains) were considered as co-variables.

Variables with p-values less than 0.20 ($p < 0.20$) were tested in the multiple Poisson regression model with robust variance in the bivariate analysis between the dependent and independent variables, considering the prevalence ratio adjusted by the method. Prevalence ratios (PR) and their respective 95% confidence intervals (95%CI) were calculated by the model mentioned above. Variables that presented p values less than 0.20 ($p < 0.20$) in the bivariate analysis were included in the multiple model and variables with p-val-

ues below 0.05 ($p < 0.05$) by the stepwise forward method remained in the final model.

Ethics aspects

This study respected all ethical aspects, by Resolution 466/2012 of the National Health Council (NHC). The research project was approved by the Ethics Committee of the University of the State of Mato Grosso (Opinion: 3.986.293/2020). All participants signed an Informed Consent Form and were treated at their homes following strict biosafety protocols. Actions to mitigate risks to participants from the research were implemented in data collection, with guidance on support networks and access to mental health promotion services on demand.

Results

A total of 4,203 individuals were analyzed (92.8% of the initial sample); most of them were aged between 18 and 93 years and predominantly aged between 30 and 49 years (41.4%), females (64.8%), brown (55.2%), whose family income ranged from one to less than three minimum wages (59.2%) and who had completed elementary school (34.6%). It was found that 24.3% of the individuals reported having signs and symptoms potentially related to COVID-19 in the last 14 days before data collection, with a 12.0% seroprevalence of antibodies against SARS-CoV-2, ranging from 7.0% to 24.3% among the ten study municipalities. The risk classification for suicidal ideation was present in 19.2%.

In the bivariate analysis, suicidal ideation was associated with low income, increased alcohol consumption, alcohol consumption almost every day of the week, increased smoking, not working at the onset of the pandemic, considering oneself neutral as to being affected by the pandemic and having COVID-19 self-reported symptoms (Table 1).

Regarding mental health aspects (DSM-5), it was found in the bivariate analysis that somatic symptoms, sleep disturbance, dissociation, depression, anger, mania, anxiety, psychosis, repetitive thoughts and behaviors, substance use, drug use and memory were associated with statistically significant values with suicidal ideation during the COVID-19 pandemic in the Mato Grosso population (Table 2).

Table 3 shows the final model adjusted by Poisson multiple regression with robust variance

between the variables suicidal ideation and sociodemographic information, lifestyle after the onset of the pandemic, behaviors while experiencing the pandemic and mental health aspects, with their respective adjusted prevalence values and confidence intervals. Most of the variables that were significant in the bivariate analysis were maintained for the multiple analysis, except for the variables: age in age groups, sex, education and mania.

In the multiple analysis, suicidal ideation was associated with variables increased consumption of alcohol (RP=1,16 IC=1,07;1,25, $p < 0,001$) and smoking (RP=1,30, IC=1,15;1,47, $p < 0,001$) after the pandemic, COVID-19 self-reported symptoms (RP=1,03, IC=1,01;1,07, $p = 0,024$), having one's life severely affected by the pandemic (RP=1,04, IC=1,01;1,07, $p = 0,019$) self-reported mental illness (RP=1,09, IC=1,03;1,16, $p = 0,005$), somatic symptoms (RP=1,15, IC=1,08;1,22, $p < 0,001$), sleep disturbance (RP=1,30, IC=1,11;1,54, $p = 0,002$), dissociation (RP=1,24, IC=1,03;1,49, $p = 0,022$), depression (RP=1,24, IC=1,06;1,46, $p = 0,008$), anger (RP=1,11, IC=1,03;1,20, $p = 0,006$), anxiety (RP=1,26, IC=1,06;1,50, $p = 0,007$), substance use (RP=1,19, IC=1,08;1,30, $p < 0,001$), drug prescription use (RP=1,18, IC=1,08;1,29, $p < 0,001$) and memory (RP=1,87, IC=1,35;2,58, $p < 0,001$). In this analysis, most variables are a risk factor for suicidal ideation, with the exception of psychosis, repetitive thoughts and behaviors and the interaction between depression and anxiety, which were negatively associated (Table 3).

Discussion

This research presented an unprecedented prevalence of suicidal ideation in a probabilistic sample of 10 municipalities in the state of Mato Grosso, in Brazil, during the COVID-19 pandemic. It was found that 19.2% of the population was classified as having suicidal ideation. Among the study factors, it was associated with the use of substances after the onset of the pandemic (increased consumption of alcohol and smoking), behaviors in the experience of the pandemic (COVID-19 self-reported symptoms, and having one's life severely affected by the pandemic) and to mental health factors (self-reported mental illness, somatic symptoms, sleep disturbance, dissociation, anger, anxiety, substance use, drug prescription use and memory). In this analysis, most variables are a risk factor for suicidal ideation, except for

psychosis, repetitive thoughts and behaviors and the interaction between depression and anxiety, which were negatively associated.

The prevalence of suicidal ideation was higher than as reported in a recent meta-analysis, covering 54 international surveys¹⁸. Niederkröthaler *et al.*²⁷ suggested a strategic approach to research on and prevention of suicide at a global level, as there are numerous uncertainties related to the direct and indirect effects of COVID-19 on sui-

cide. In both, Brazil and Mato Grosso, studies on the prevalence of suicidal ideation in the general population are scarce, even with high rates of suicide deaths recorded in the country²⁰. However, some studies on suicidal ideation with Brazilian populations, such as a systematic review with children and adolescents in the COVID-19 pandemic, found a prevalence that ranged from 29 to 31.3%²⁸, and another study with Brazilian undergraduate students in the area of health was 26.33%²⁶.

Table 1. Bivariate analysis between suicidal ideation and sociodemographic aspects, substance use after the onset of the pandemic, behaviors in the experience of the pandemic in the population of the Brazilian Midwest, Mato Grosso, Brazil, September/October 2020 (N=4,203).

Variables	Suicidal ideation		PR _b **	95%IC**	p-value
	Yes	No			
Age group					
18-29	505	134	1.00	-	-
30-49	1,242	300	1.01	(0.97; 1.07)	0.673
50-59	684	143	1.01	(0.99; 1.10)	0.737
≥60 years	964	231	0.99	(0.97; 1.07)	0.585
Sex					
Female	2,220	507	0.99	(0.95; 1.02)	0.417
Male	1,175	301	1.00	-	-
Ethnicity/skin color					
Indigenous	2	1	1.06	(0.89; 1.26)	0.521
Black	413	66	1.04	(0.99; 1.09)	0.077
Yellow	25	6	1.03	(0.92; 1.15)	0.583
Brown	1,902	419	1.00	(0.97; 1.04)	0.816
White	1,012	241	1.00	-	-
Family income					
<1 MW	133	175	0.47	(0.38; 0.61)	<0.001*
1≤MW<3 MW	2,033	455	0.96	(0.93; 0.99)	0.018*
>3 MW	1,137	161	1.00	-	-
Schooling					
No schooling	154	41	1.01	(0.93; 1.09)	0.83
Incomplete/complete elementary school	1,176	280	1.02	(0.97; 1.07)	0.284
Incomplete/complete high school	1,164	249	1.03	(0.98; 1.08)	0.217
Undergraduate and more	875	182	1.00	-	-
Use of substances after the onset of the pandemic					
Increased alcohol consumption					
Yes	3,074	150	1.74	(1.53; 1.98)	<0.001*
No	321	658	1.00	-	-
Frequency of weekly alcohol consumption					
Nearly every day	2,674	689	0.95	(0.91; 0.99)	0.020*
More than half the days	14	1	0.99	(0.83; 1.18)	0.930
Several days	299	57	1.00	(0.95; 1.05)	0.953
Rare, less than a day or two	408	61	1.00	-	-
Increased smoking					
Yes	3,214	353	2.49	(2.06; 3.00)	<0.001*
No	181	455	1.00	-	-

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Table 1. Bivariate analysis between suicidal ideation and sociodemographic aspects, substance use after the onset of the pandemic, behaviors in the experience of the pandemic in the population of the Brazilian Midwest, Mato Grosso, Brazil, September/October 2020 (N=4,203).

Variables	Suicidal ideation		PR _b **	95%IC**	p-value
	Yes	No			
Behaviors in the experience of the pandemic					
Worked at the beginning of the pandemic					
No	1,901	529	1.07	(1.04; 1.11)	<0.001*
Yes	1,494	279	1.00	-	-
How much has your life been affected by the pandemic					
Very affected	627	114	0.97	(0.94; 1.01)	0.111
Affected but still feels good most of the time	736	100	0.96	0.91; 1.01)	0.082
Neutral	890	447	0.83	(0.79; 0.88)	<0.001*
Unaffected	1,142	147	1.00	-	-
COVID-19 self-reported symptoms					
Yes	878	154	1.04	(1.01; 1.08)	0.011*
No	2,517	654	1.00	-	-
Presence of antibodies against SARS-CoV-2					
Positive	474	105	0.97	(0.91; 1.02)	0.265
Negative	2,921	703	1.00	-	-

*Weighted Prevalence; PR: prevalence ratio estimated by the simple robust Poisson regression model. 95%CI: 95% confidence interval. Significant at the 5% level. **Prevalence rates and 95% confidence intervals (95%CI) estimated under weightings of sample weights. MW: minimum wage.

Source: Authors.

Table 2. Bivariate analysis between suicidal ideation and mental health aspects during the pandemic in the population of the Brazilian Midwest, Mato Grosso, Brazil, September/October 2020 (N=4,203).

Variables DSM-5	Suicidal ideation			95%CI**	p-value
	Yes	No	PR _b **		
Previous mental illness					
Yes	152	26	0.093	(0.99; 1.13)	0.093
No	3,242	782	-	-	-
Somatic symptoms					
Yes	3,115	85	<0.001*	(1.74; 2.73)	<0.001*
No	280	723	-	-	-
Sleep disorder					
Yes	3,263	128	<0.001*	(2.74; 4.65)	<0.001*
No	132	680	-	-	-
Dissociation					
Yes	3,198	111	<0.001*	(2.61; 4.67)	<0.001*
No	197	697	-	-	-
Depression					
Yes	3,057	173	<0.001*	(1.65; 2.17)	<0.001*
No	338	635	-	-	-
Anger					
Yes	3,139	222	<0.001*	(1.83; 2.57)	<0.001*
No	256	586	-	-	-
Mania					
Yes	2,966	130	<0.001*	(1.54; 1.94)	<0.001*
No	429	678	-	-	-

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Table 2. Bivariate analysis between suicidal ideation and mental health aspects during the pandemic in the population of the Brazilian Midwest, Mato Grosso, Brazil, September/October 2020 (N=4,203).

Variables DSM-5	Suicidal ideation				
	Yes	No	PR _b **	95%CI**	p-value
Anxiety					
Yes	2,717	76	<0.001*	(1.33; 1.53)	<0.001*
No	678	732	-	-	-
Psychosis					
Yes	256	734	<0.001*	(0.30; 0.42)	<0.001*
No	3,139	74	-	-	-
Repetitive thoughts and behaviors					
Yes	182	727	<0.001*	(0.24; 0.41)	<0.001*
No	3,213	81	-	-	-
Substance Use					
Yes	1,240	719	<0.001*	(0.75; 0.83)	<0.001*
No	2,155	89	-	-	-
Drug prescription use					
Yes	2,500	724	<0.001*	(0.89; 0.95)	<0.001*
No	895	84	-	-	-
Memory					
Yes	3,261	121	<0.001*	(4.03; 6.97)	<0.001*
No	134	687	-	-	-

PR: prevalence ratio estimated by the simple robust Poisson regression model. 95%CI: 95% confidence interval. *Significant at the 5% level. **Prevalence rates and 95% confidence intervals (95%CI) estimated under weightings of sample weights.

Source: Authors.

Table 3. Multiple analysis between suicidal ideation and psychosocial, lifestyle and pandemic-related variables in 4,203 individuals from the Brazilian Midwest, Mato Grosso, Brazil, September/October 2020.

Variables	PRa**	95%CI**	p-value
Use of substances after the onset of the pandemic			
Increased alcohol consumption			
Yes	1.16	(1.07; 1.25)	<0.001*
No	1.00	-	-
Increased use of tobacco			
Yes	1.30	(1.15; 1.47)	<0.001*
No	1.00	-	-
Behaviors in the experience of the pandemic			
COVID-19 self-reported symptoms			
Yes	1.03	(1.01; 1.07)	0.024*
No	1.00	-	-
How much has your life been affected by the pandemic			
Very affected	1.04	(1.01; 1.07)	0.019*
Affected but still feels good most of the time	0.97	0.94; 1.01)	0.178
Neutral	0.98	(0.96; 1.02)	0.187
Unaffected	1.00	-	-
Aspects of mental health – DSM-5			
Previous mental illness			
Yes	1.09	(1.03; 1.16)	0.005*
No	1.00	-	-

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Table 3. Multiple analysis between suicidal ideation and psychosocial, lifestyle and pandemic-related variables in 4,203 individuals from the Brazilian Midwest, Mato Grosso, Brazil, September/October 2020.

Variables	PRa**	95%CI**	p-value
Somatic symptoms			
Yes	1.15	(1.08; 1.22)	<0.001*
No	1.00	-	-
Sleep disorder			
Yes	1.30	(1.11; 1.54)	0.002*
No	1.00	-	-
Dissociation			
Yes	1.24	(1.03; 1.49)	0.022*
No	1.00	-	-
Depression			
Yes	1.24	(1.06; 1.46)	0.008*
No	1.00	-	-
Anger			
Yes	1.11	(1.03; 1.20)	0.006*
No	1.00	-	-
Anxiety			
Yes	1.26	(1.06; 1.50)	0.007*
No	1.00	-	-
Psychosis			
Yes	0.89	(0.81; 0.99)	0.030*
No	1.00	-	-
Repetitive thoughts and behaviors			
Yes	0.80	(0.68; 0.93)	0.004*
No	1.00	-	-
Substance use			
Yes	1.19	(1.08; 1.30)	<0.001*
No	1.00	-	-
Drug prescription use			
Yes	1.18	(1.08; 1.29)	<0.001*
No	1.00	-	-
Memory			
Yes	1.87	(1.35; 2.58)	<0.001*
No	1.00	-	-
Interaction between depression and anxiety			
Yes	0.79	(0.65; 0.92)	0.005*
No	1.00	-	-

PR: prevalence ratio estimated by Poisson regression model with robust variance. 95%CI: 95% confidence interval. *Significant at the 5% level. **Prevalence rates and 95% confidence intervals (95%CI) estimated under weightings of sample weights.

Source: Authors.

In the present study, we identify the association of suicidal ideation and increased alcohol consumption almost every day of the week, increased smoking, substance and drug prescription use. A study found that 15.1% of the US adult population reported increased substance use, and 11.9% reported suicidal ideation during the COVID-19 pandemic²⁹.

In previous pandemics, there have been negative impacts of social distancing, and in the case of the SARS-CoV virus, it was reported that this viral spread mitigation strategy contributed to an increase in the suicide rate during the SARS epidemic in 2003 in Hong Kong³⁰. However, there is still no evidence of whether or not, in the current pandemic, the fact of being infected and/or

becoming ill increases suicidal ideation. In the present study, this association was not found, as the difficulties arising from social distancing, economic crisis, fear of illness and grief may be at the heart of this process. Suicidal ideation can be, independent of the infection itself.

On the other hand, there was an association between COVID-19 self-reported symptoms and suicidal ideation, which encourages reflection on the possible impact of social boycott and discrimination on suicide, as described by Mamun *et al.*³¹ in the report of the first case of suicide by COVID-19 in Bangladesh, where a young man committed suicide owing to social evasion by neighbors and fear of transmitting the virus to his community.

A longitudinal study analyzed aspects of social distancing and the feeling of being alone, and there was an association with suicidal ideation³². In descriptions post-pandemic, it was reported that social isolation, anxiety, fear of contagion, uncertainty, chronic stress and economic difficulties can contribute to the development or exacerbation of stress-related illnesses and suicide³³. In Poland and Lithuania, it was found that high levels of adjustment problems, loneliness and staying longer at home during the COVID-19 pandemic were significantly associated with suicidal ideation³⁴.

A study with the Japanese adult population, focusing on the profile of people with suicidal ideation during the COVID-19 pandemic, found that young people, who worked in unstable jobs, had no children, had a low income and who received psychiatric care were those with the highest levels of this impact on their mental health³⁵. This finding is similar to the profile of the population in the present study.

Even though it did not remain in the statistical modeling used in the present study, it should be noted that in the bivariate analysis, low income and the fact of not working in the first wave of the pandemic were associated with suicidal ideation. The association of unemployment, precarious jobs and low income were described as responsible for the higher risk of suicidal behavior^{36,37}. In a predictive study published in May 2020³⁸, it was reported that in a scenario with high numbers of COVID-19, the world unemployment rate would increase from 4.9% to 5.6%, increasing suicides annually to about 9,570 per year.

Uncertainties, especially economic ones, were associated with factors related to mental illness and suicide³⁹. This finding can encourage the population to reflect on how the pandemic af-

fects their lives, as shown in our study when the respondents considered that life was greatly affected; it was associated with suicidal ideation in the population of Mato Grosso. High unemployment rates, in addition to being associated with suicide, were also related to a higher prevalence of depression, alcohol consumption and other substance use disorders⁴⁰.

It is known that, worldwide, 90% of individuals who committed suicide had some type of psychiatric disorder¹⁴, and that the warning about the increased risk of developing suicidal ideation in people with preexisting mental disorders was issued by psychiatry authorities at the onset of the COVID-19⁴¹ pandemic. Thus, the present study sought to analyze the other domains proposed by the DSM-5, in addition to the presence of self-reported mental illness, and an association was found between these risk factors in the multivariate analysis: somatic symptoms, sleep disturbance, dissociation, depression, anger, anxiety, substance use, drug prescription use and memory.

The increase in somatic symptoms during the COVID-19 pandemic, such as hypochondria, somatization and chronic pain, has been related to impotence arising from the uncertainties of pandemic lifestyle changes⁴². This growth of somatic symptoms in the population raises concern, as there is reported that somatic symptoms can be predictors of suicidal ideas⁴³.

The prolonged experience of social distancing can directly impact the quality of sleep and memory. This mixed of feelings has already been described as a point of concern that can cause various mental symptoms and lead to the development of anxiety disorders, depression and sleep disorders⁴⁴. In a study conducted by Killgore *et al.*⁴⁵, insomnia was found to be the major trigger for fear of the pandemic and suicidal thoughts, a finding that is corroborated in the descriptions by Sher³³, who argued that sleep abnormalities are an autonomous risk factor for suicidal ideation and its consequences.

The relationships between insomnia, depression and anxiety can be considered bidirectional, as insomnia contributes to symptoms of depression and anxiety, while depression and anxiety disturb sleep, and this complex process is described as a risk factor for suicidal behavior⁴⁶. A study indicated that loneliness and sensitivity to anxiety are important correlates of suicidal ideation⁴⁷.

Using different instruments, studies conducted during the COVID-19 pandemic showed high anxiety rates (14.1% and 20.8%) in the popula-

tion^{48,49}. A particular study showed an increase in anxiety symptoms⁵⁰. In another study, 33% of the sample had symptoms of anxiety or depression, which were related to suicidal ideation⁵¹.

In the present study, depression and anxiety were associated with suicidal ideation when analyzed on their own. Depression is included among the mental and neurological manifestations of COVID-19⁵², and important rates were found in the populations of the UK (29.5%)⁴⁹ and the USA (19.5%)⁵³. In addition, there were potential chances for anxiety and depression among those with suicidal ideation in Greece⁴⁸.

In dissociation, it can be seen, in more severe ways, that a defense can be instituted by the subject when feeling unprotected in response to the invasion of pain and real trauma⁵⁴. This is a plausible situation in the current moments imposed by the COVID-19 pandemic, and they can potentiate other problems previously described, such as dissociative amnesia, sexual dysfunction, eating disorders, post-traumatic stress and suicide attempts⁵⁵.

Anger-related disorders may be related to suicidal ideation, especially when there is a loss of control in the face of limiting situations, further enhanced by stress, fears and anguish arising from social distancing². A study with psychoactive substance dependents found that behavioral and emotional changes such as increased expression of anger may be closely related to suicidal behavior⁵⁶.

Psychosis, repetitive thoughts and behaviors were statistically associated as protective factors. In contrast, verbal and auditory hallucinations increased the chances of a suicide attempt in adolescents with suicidal ideation⁵⁷, and the incidence of psychosis is an important risk factor for suicidal behavior in people who have experienced infections by SARS, MERS and H1N⁵⁸. The same occurred in the analyses by Benatti *et al.*⁵⁹, who found an increase in suicidal ideation in patients with repetitive thoughts and behavior disorders in Italy.

In our study, there was also an association between suicidal ideation and substance use and use of medication, also evidenced in other studies, such as Czeisler *et al.*³¹ that observed in Australian population the start of using new substances or increased their consumption to dealing with of the pandemic. Drug abuse and prolonged drug use were also associated with suicidal behavior among Brazilian men⁶⁰.

Memory was also associated with suicidal ideation in the population studied in Mato Grosso,

as well as in a North American study before the pandemic in which deficits in specific components of attention control and memory were associated with suicidal behavior and depression⁶¹.

The major limitation of the present study is that its design does not allow causal conclusions between predictors and suicidal ideation; however, it explores the relationship between the variables, with consistent results such as those found in longitudinal studies. Additionally, there was still the risk of interviewer bias and to minimize it, previous training of interviewers and field supervision were carried out, memory bias and desirability bias related to mental health issues (answers from socially accepted standards) can also be cited regarding the participants, and to mitigate them, the interview was carried out in a reserved place, ensuring all the time necessary, in addition to emphasizing anonymity of your answers.

Conclusion

Factors associated with suicidal ideation during the COVID-19 pandemic in a region of the Legal Amazon were: self-reported mental illness, somatic symptoms, sleep disturbance, dissociation, depression, anger, anxiety, memory changes, and increased alcohol consumption. and smoking. These factors, in addition to acting in suicidal ideation, are part of an important group of clinical conditions, which can be easily detected and treated in Primary Health Care (PHC) in the Brazilian National Health System, before presenting characteristics for referral to reference services. However, the aggravation of such factors, either by silencing those who are more vulnerable or by the lack of recognition of professionals and services in welcoming these psycho-emotional demands in the community, potentiate the occurrence of suicidal ideation, and its repercussions harm the quality of life of the person/family when they can even cost their lives.

Suicidal ideation as a moment/step that precedes completed suicide, and which can be worked on without requiring large financial and technological investments, should be included in the list of health education topics of family health teams, and be part of the identified aspects in routine consultations, since many diseases, prevalent in daily care in PHC, have risk factors that predispose to mild to severe mental disorders.

The identification of factors associated with suicidal ideation in this region can collaborate

with new care strategies, from those designed in the training scope of future professionals to continuing education programs, by signaling profiles

of people who are susceptible to suicidal ideation and strengthening actions surveillance, for the promotion of life and well-being.

Collaborations

ACPT Trettel contributed to the conception, design, data collection, data interpretation, writing, critical review and approval of the version. AP Muraro contributed to the conception, design, data collection, data interpretation, writing, critical review and approval of the version. EC Oliveira contributed to the data collection, writing, critical review and approval of the version. VF Nascimento contributed to the data interpretation, writing, critical review and approval of the version. ACS Andrade contributed to the conception, design, data collection, data interpretation, writing, critical review and approval of the version. ES Santos contributed to the data interpretation, critical review and approval of the version. MM Espinosa contributed to the data interpretation, writing, critical review and approval of the version. SC Pillon contributed to the conception, design, data collection, data interpretation, writing, critical review and approval of the version.

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