

## THE MENTAL HEALTH AND THE WORK OF ENDEMIC DISEASE CONTROL AGENTS IN THE COVID-19 PANDEMIC

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**Highlights:** (1) The precariousness of work and work during the pandemic have resulted in effects on mental health. (2) Sleep disturbance was the main complaint mentioned by the workers. (3) The category needs to be monitored due to exposure to pesticides.

PRE-PROOF

(as accepted)

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**THE MENTAL HEALTH AND THE WORK OF ENDEMIC DISEASE  
CONTROL AGENTS IN THE COVID-19 PANDEMIC**

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### **ABSTRACT**

This study aimed to investigate the occurrence of common mental disorders in Vector Control Workers (VCW) (Agentes de Combate à Endemias - ACE) in the state of Rio de Janeiro and the relationship with health and work conditions in the context of the COVID-19 pandemic.

**Methodology:** This work used a cross-sectional study inspired by the Italian Workers' Model (MOI) and, therefore, with the participation of workers and unions in the category. Data collection was through a self-administered multidimensional questionnaire (online) that included the Self-Report Questionnaire (SRQ) for screening common mental disorders (CMD) from a sample of 139 participants. The statistical analysis used Pearson's chi-square and Fisher's exact tests. **Results:** We found that 43.2% of VCW had suspected CMD associated with gender ( $p \leq 0.04$ ), demand for mental health professionals ( $p \leq 0.021$ ), and different pre-pandemic complaints related to mental health ( $p \leq 0.00$ ). During the first months of the pandemic, more than 80% of VCW were working; 6.5% reported suicidal ideation and 15.8% depression. The research allowed actions to welcome and monitor workers in real-time and created a space for dialogues about mental health and work, especially during the pandemic. **Conclusion:** The research made it possible to identify the demands of VCW regarding mental health. Even though they are a predominantly male class, we observed important differences in the impact of the pandemic on the mental health of women and workers who had to work to combat COVID-19. Monitoring this population is essential because of their exposure to pesticides.

**Keywords:** worker health; mental disorders; vector control

**THE MENTAL HEALTH AND THE WORK OF ENDEMIC DISEASE  
CONTROL AGENTS IN THE COVID-19 PANDEMIC**

## **INTRODUCTION**

Mental and behavioral disorders are one of the leading health problems and causes of work leave of absence, contributing significantly to morbidity and mortality in the population, with common mental disorders (CMD) standing out among them<sup>(1)</sup>. A set of non-psychotic symptoms, such as insomnia, fatigue, irritability, forgetfulness, difficulty concentrating, and somatic complaints<sup>(2)</sup>, characterize CMDs, which indicate situations of mental suffering or illness. CMDs are often intertwined with subclinical conditions of anxiety, depression, and stress, becoming one of the most significant challenges for public health <sup>(1)</sup>.

A widely used tool for screening common mental disorders in population and occupational groups is the Self-Reporting Questionnaire (SRQ-20). The instrument, validated in Brazil <sup>(3)</sup>, consists of twenty dichotomous questions relating to physical symptoms and non-psychotic, psycho-emotional changes. The World Health Organization (WHO) recommends it for collective and occupational studies due to criteria such as ease of application and low cost. However, it is not a diagnostic instrument, but it indicates suspicion of CMD <sup>(4)</sup>.

In the context of the COVID-19 pandemic, several health professionals faced an intense work overload, which made some categories even more vulnerable to suffering and mental illness <sup>(5)</sup>. Community Health Agents (CHA) and Vector Control Workers (VCW) stand out among the professionals who worked in this context. According to Lotta et al.<sup>(6)</sup>, these were the health professionals most reported fear when facing the coronavirus (91.3%), with a higher percentage compared to nursing professionals (84.3%). Only 7.6% felt prepared to act in this situation.

Vector Control Workers, popularly known as “mosquito killers,” have been involved in public health campaigns for over a century, with actions aimed at promoting health, preventing diseases, and combating vectors. However, the model adopted to combat arboviruses is still based on chemical management with pesticides (e.g., organophosphates, carbamates, and pyrethroids), leading to work processes that are harmful to health. Additionally, they face social and work precariousness, crossed by different psychosocial dimensions, such as moral harassment, demanding targets, and inadequate training that, over the years, have contributed to

## THE MENTAL HEALTH AND THE WORK OF ENDEMIC DISEASE CONTROL AGENTS IN THE COVID-19 PANDEMIC

the illness and mental suffering of many workers, a situation worsened during the COVID-19 pandemic <sup>(7)</sup>.

Although the work of VCW dates back more than a century, studies on this category are still incipient in Brazil, which makes the investigation of the health-work relationship necessary and relevant. Research enables the collection of data and the creation of action strategies for the Surveillance of Workers' Health, having as fundamental principles the promotion and protection of health against harm resulting from production models and processes.

In this sense, understanding the importance of VCW' activities, especially in a pandemic context, the present study aimed to investigate the occurrence of common mental disorders among VCW in the state of Rio de Janeiro and the relationship with health and work conditions during the COVID-19 pandemic.

### METHODOLOGY

The study and its developments result from research carried out during the master's degree and are part of the multicenter project "Study of the impact on the health of disease control agents/endemic guards due to pesticide exposure in Rio de Janeiro." The research is situated in Workers' Health, inspired by the Italian Workers' Movement (MOI) (8). It, therefore, relies on the active and leading participation of workers and unions in the category, based on discussion forums and the construction of the questionnaire itself, from the perspective of the Expanded Research Community.

The MOI constituted an important movement for the strengthening of the working class and the fight in defense of health, articulating principles and concepts such as agreed validation, non-delegation of health, valuing experience, protagonism and subjectivity of workers, defense of health in the workplace, and socialization of knowledge <sup>(8)</sup>.

Given the workers' demands, an exploratory and descriptive cross-sectional study was conducted with Vector Control Workers from the state of Rio de Janeiro, working in different municipalities and with statutory ties at the federal and municipal levels, as well as those under the CLT. It is worth noting that there are different nomenclatures to designate the activity of these professionals; however, in this article, we chose to follow the name given to the category in its legal framework, Law No. 11,350, of October 5, 2006: Vector Control Workers <sup>(9)</sup>.

**THE MENTAL HEALTH AND THE WORK OF ENDEMIC DISEASE  
CONTROL AGENTS IN THE COVID-19 PANDEMIC**

Following protocols established during the pandemic, data were collected remotely using a research management application, Google Forms®. The Informed Consent Form (ICF) was made available at the beginning of the research to obtain consent and later print or capture the screenshot. Participants' identification data (name, email, and/or telephone number) were requested to proceed with the second stage of the investigation and assessment of health and pesticide exposure.

The questionnaire was sent from August 26 to October 31, 2020, and 145 completed forms were received, but the final sample consisted of 139 participants. The inclusion criteria for the study were being a vector control/endemic disease control worker over 18 years of age, of either gender, with a statutory CLT or contractual employment relationship. The exclusion criteria adopted were working in other states, being inactive/retired, and being a community health agent (CHA).

The questionnaire included sociodemographic questions, questions on work characteristics, occupational exposure, and health in the context of the COVID-19 pandemic, and the SRQ-20 for screening for CMD. For this research, the cut-off value of 7/8 (cases  $\geq 8$ ) was chosen for both genders, as indicated by Gonçalves et al. (4), considering that, in a pandemic context, workers could present higher suffering and symptoms related to CMD more frequently than in non-pandemic situations.

We calculated each listed variable's absolute and relative frequencies. The statistical techniques of frequencies for nominal variables and the measures of central tendency and dispersion for continuous variables (median and interquartile range) were applied to characterize the sample using the Statistical Package for the Social Sciences (SPSS) for Windows, version 21.0 (SPSS Inc.)®.

The independent variables were gender, age, marital status, family income, education, use of psychotropic drugs, seeking mental health professionals, complaints presented before the pandemic, being in isolation or physical/social distancing, activity performed, work situation during the pandemic, use of pesticides, smoking, and consumption of alcoholic beverages. The SRQ-20 score for suspected CMD represented the dependent variable. In addition to these variables, we added item 17 of the SRQ-20 (Have you had thoughts of ending your own life?) as a variable of interest. Since the sample did not present a normal distribution, the nonparametric

**THE MENTAL HEALTH AND THE WORK OF ENDEMIC DISEASE  
CONTROL AGENTS IN THE COVID-19 PANDEMIC**

Pearson chi-square ( $\chi^2$ ) and Fisher's exact tests were used to detect the associations between the variables studied. A significance level of 5% and a confidence interval of 95% were assumed. To improve the quality of the analyses due to the sample size, we grouped the variables of age, education, and time of work in the last activity.

Cronbach's alpha value, which assesses the internal consistency and degree of reliability of the SRQ-20 responses in the sample studied, was calculated and resulted in  $\alpha=0.88$ , corroborating the good internal consistency of the instrument.

This research was approved by the Research Ethics Committee (CEP) of the Sergio Arouca National School of Public Health (Ensp/Fiocruz) with the opinion registered under number 03323018.4.0000.5240.

## **RESULTS**

### **Characterization of the Population and Health and Work Conditions during the COVID-19 Pandemic**

The study population consisted of 139 VCW, predominantly male (69%), located in the metropolitan region of the state of Rio de Janeiro (71%), self-declared black (75.5%), married or living with a partner (80%), and with an average age of 53 years (49-57). Of the workers who reported a family income above five minimum wages, 96% were federal public workers. CLT workers had the lowest income (1-3 minimum wages) (Table 1).

The VCW perform several activities, sometimes Simultaneously; the most cited were: field agents (88%); application of pesticides (19%) - through ultra-low volume (fogging), nebulizers, backpack, and sprinkler pumps; information, education, and communication (19%); coordination and supervision (16%); product preparation (11.5%); and administrative activities (11.5%), among others. The average time in the activity was 16 years, and the median was 15 years (6-28 years). Notably, 61.2% (n = 85) reported that their activities involved handling, contacting, or applying pesticides.

**THE MENTAL HEALTH AND THE WORK OF ENDEMIC DISEASE  
CONTROL AGENTS IN THE COVID-19 PANDEMIC**

**Table 1 - Sociodemographic characterization of Vector Control Workers (VCW) according to gender, color/ethnicity, age group, marital status, education and family income, places of assignment, Rio de Janeiro, 2020.**

Variables	N	%
<b>Gender</b>		
Male	96	69.1
Female	43	30.9
<b>Color/ethnicity</b>		
White	33	23.7
Black	105	75.5
Oriental/Indigene	1	0.7
<b>Age</b>		
25-50 (1° third)	52	37.4
51-55 (2° third)	42	30.2
56-70 (3° third)	45	32.4
<b>Schooling</b>		
College graduate/Post-graduate	51	36.7
College (incomplete)	19	13.7
High-school graduate	61	43.9
Middle/jr. high complete/high school incomplete	8	5.8
<b>Family Income*</b>		
> 5 minimum wages	48	34.5
Between 4-5 minimum wages	37	26.6
Between 3-4 minimum wages	23	16.5
Between 2-3 minimum wages	15	10.8
Between 1-2 minimum wages	16	11.5
<b>Lotação por regiões do estado do Rio de Janeiro</b>		
Metropolitan	102	76.1
North region	14	10.4
Green Coast	6	4.5
Central-South region	1	0.7
Mountain region	2	1.5
Coastal lowlands	9	6.7
<b>Vínculos de trabalho</b>		
Federal Public Worker (Department of Health)	107	77.0
Municipal Public Worker	26	18.7
CLT	6	4.3
Total	139	100.00

Source: authors. Minimum wage in force in 2020, R\$ 1,045.00\*

As shown in Table 2, more than 80% of VCW had returned to full-time or part-time in-person activities during the data collection period.

Regarding the diagnosis of COVID-19, 40.3% of VCW mentioned coworkers with a positive diagnosis and 17.3% reported cases among family members and friends. In addition to

**THE MENTAL HEALTH AND THE WORK OF ENDEMIC DISEASE  
CONTROL AGENTS IN THE COVID-19 PANDEMIC**

COVID-19, 78% reported some previously diagnosed disease, with a higher occurrence in the first third of 25-50 years (40%) and 62.6% regularly use medications, 11.5% of which are psychotropic. Among the VCW investigated, 18% reported a diagnosis of some mental or behavioral disorder, especially depression (15.8%), and 23.7% of workers indicated the need to seek a mental health professional.

**Table 2 - Health and work of Vector Control Workers (VCW) in the context of the COVID-19 pandemic, (n = 139), Rio de Janeiro, 2020**

Variables	N	%
<b>Have been in isolation/social distancing at any point</b>		
No	63	45.3
Yes	76	54.7
<b>COVID-19 Diagnose</b>		
Diagnosed with COVID-19 w/o hospitalization	11	7.9
Suspected/probable case of COVID-19	6	4.3
Not diagnosed with COVID-19	122	87.8
<b>Employment situation at the time of the survey</b>		
Did not return to activities	18	12.9
Remote work	3	2.2
Work on the streets with reduced working hours	42	30.2
Full-time street work	74	53.2
Removal due to suspected COVID-19	1	0.7
Indoor work	1	0.7
<b>Personal Protective Equipment (PPE)</b>		
No	73	52.5
Yes	66	47.5
<b>Consumo de bebidas alcoólicas</b>		
No	64	46.0
Yes	75	54.0
<b>Frequency*</b>		
Up to 3 times a month	33	45.8
1 to 2 times a week	31	43.1
3 to 4 times a week	5	6.9
5 times a week or more	3	4.2
<b>Drank more during isolation/social distancing</b>		
No	114	82.0
Yes	25	18.0
<b>Tabagismo</b>		
Non-smoker	85	61.2
Ex-smoker	35	25.2
Smoker	19	13.7
<b>Cigarette consumption/day*</b>		
≤10	11	47.8
11-20	7	30.4
21-30	5	21.7
Total	23	100.0



**THE MENTAL HEALTH AND THE WORK OF ENDEMIC DISEASE  
CONTROL AGENTS IN THE COVID-19 PANDEMIC**

<b>Smoked more during isolation/social distancing*</b>		
No	72	86.7
Yes	11	13.3
Total	83	100.0
<b>Illnesses diagnosed by a doctor**</b>		
No	31	22.3
Yes	108	77.7
Total	139	100.00
<b>Regular use of medication</b>		
No	52	37.4
Yes	87	62.6
<b>Diagnóstico de transtornos mentais e comportamentais**</b>		
No	114	82.0
Yes	25	18.0
<b>Strategies for dealing with confinement</b>		
No	9	7.0
Yes	119	93.0
Total	139	100.0

Source: Prepared by the authors. \*Note: variables with N lower than the total population studied. \*\* Illnesses were self-reported

Regarding alcohol consumption and smoking, 54% mentioned that they consumed alcoholic beverages, and 18% drank more during the pandemic. Only 14% declared themselves smokers, and 13% reported that they smoked more during isolation (Table 2).

When stratified by gender, 63.6% ( $p \leq 0.03$ ;  $\phi = 0.260$ ) of those who smoked more during isolation were female, as were 68.8% ( $p \leq 0.01$ ;  $\phi = 0.295$ ) of those who used psychotropic drugs. Still, regarding women, 37.2% ( $X^2(1) = 6.238$ ,  $p \leq 0.01$ ;  $\phi = 0.213$ ) sought support from mental health professionals, and 26.6% ( $X^2(1) = 4.45$ ,  $p \leq 0.035$ ;  $\phi = 0.179$ ) reported a diagnosis of depression.

During the social isolation imposed by the pandemic, 93% of workers created strategies to deal with the possible stress caused by confinement and/or social distancing from family and friends (Table 2). The most used means by VCW were establishing contact through social networks (57%), including new activities in the routine (45%), investing in spirituality (31%), and supporting social projects and volunteer work (11%).

The variables color/race ( $p = 0.385$ ), family income ( $p = 0.370$ ), age group ( $p = 0.593$ ), education ( $p = 0.549$ ), and being or not in isolation or social distancing during the pandemic ( $p = 0.857$ ) did not show statistically significant associations with CMD.

**THE MENTAL HEALTH AND THE WORK OF ENDEMIC DISEASE  
CONTROL AGENTS IN THE COVID-19 PANDEMIC**

**Mental health**

The screening indicated that 43.2% (n = 60) of the study population presented criteria indicative of CMD with a statistically significant association with gender, pre-pandemic complaints, and search for mental health professionals (Table 3). It is worth noting that, among female participants, 55.8% presented suspected CMD.

The main complaints reported before the pandemic were sleep disorders (54.7%), fatigue/tiredness (44.6%), headache (42.4%), irritability (41.7%), discouragement (38.1%), and lack of interest in work (16.5%), all of which showed a statistically significant association with CMD (Table 3).

**THE MENTAL HEALTH AND THE WORK OF ENDEMIC DISEASE  
CONTROL AGENTS IN THE COVID-19 PANDEMIC**

**Table 3 – Screening of common mental disorders and association with sex, demand for mental health professionals, and complaints/symptoms presented before the COVID-19 pandemic (n = 139), Rio de Janeiro, 2020**

<b>Variables</b>	<b>N (%)</b>	<b>CMD<sup>a</sup>(%)</b>	<b><math>\chi^{2*}</math></b>	<b>p-value</b>
<b>Gender</b>				
Female	43 (39.9)	55.8	4.060	0.044
Male	96 (69.1)	37.5		
<b>Sought out mental health professional</b>				
Yes	33 (23.7)	60.6	5.365	0.021
No	106 (76.3)	37.2		
<b>Main complaints pre-pandemic</b>				
<b>Sleep changes</b>				
Yes	76 (54.7)	57.9	14.829	0.000
No	63 (45.3)	25.4		
<b>Discouragement</b>				
Yes	53 (38.1)	71.7	28.427	0.000
No	86 (61.9)	25.6		
<b>Hand tremors</b>				
Yes	26 (18.7)	65.4	6.440	0.011
No	113 (81.3)	38.1		
<b>Irritability</b>				
Yes	58 (41.7)	63.8	17.263	0.000
No	81 (58.3)	28.4		
<b>Tiredness/fatigue</b>				
Yes	62 (44.6)	59.7	12.438	0.000
No	77 (55.4)	29.9		
<b>Headache</b>				
Yes	59 (42.4)	59.3	10.908	0.001
No	80 (57.6)	31.3		
<b>Sadness</b>				
Yes	43 (30.9)	84.4	**	0.001
No	96 (69.1)	22.9		
<b>Lack of interest in work</b>				
Yes	23 (16.5)	36.2	13.837	0.000
No	116 (83.5)	78.3		

Source: Prepared by the authors. \*Pearson's chi-square test. \*\*Fisher's exact test. CMDa: prevalence (%) of cases according to the variable analyzed (n = 60).

In the distribution of factors by symptom groups, the group related to depressive-anxious mood presented the highest average of positive responses (45%), followed by the group of psychosomatic symptoms with 37% (Table 1). Also, nine (6.5%) of the responding workers reported suicidal thoughts/ideations.

Among these workers, 56% were male, 67% were married, aged 25-50 (67%), municipal civil servants (44%), with a high school diploma (44%), family income between 1-2 minimum

**THE MENTAL HEALTH AND THE WORK OF ENDEMIC DISEASE  
CONTROL AGENTS IN THE COVID-19 PANDEMIC**

wages, and all worked as field agents. In addition, seven worked the streets part-time or full-time at the beginning of the pandemic.

**Chart 1 - Frequency of responses to the Self-Reporting Questionnaire-20 (SRQ-20) by symptoms groups (n = 139), Rio de Janeiro, 202**

SRQ-20 Symptoms Groups	Yes (%)	No (%)
<b>Depressive anxious-mood</b>		
Do you feel nervous, tense or worried?	99 (71.2)	40 (28.8)
Do you get scared easily?	47 (33.8)	92 (66.2)
Have you been feeling sad lately?	71 (51.1)	68 (48.9)
Have you been crying more than usual?	32 (23.0)	107 (77.0)
<b>Somatic symptoms</b>		
Do you have frequent headaches?	58 (41.7)	81(58.3)
Do you sleep badly?	84 (60.4)	55 (39.6)
Do you suffer from poor digestion?	52 (37.4)	87 (62.6)
Do you have unpleasant sensations on your stomach?	56 (40.3)	83 (59.7)
Do you have no appetite?	20 (14.4)	119 (85.6)
Do you have tremors in your hands?	35 (25.2)	104 (74.8)
<b>Decrease in vital energy</b>		
Do you tire easily	65 (46.8)	74 (53.2)
Do you have trouble making decisions?	46 (33.1)	93 (66.9)
Do you find it difficult to carry out your daily activities satisfactorily?	59 (42.4)	80 (57.6)
Are you having difficulties at work (is your work arduous, does it cause you suffering?)	26 (18.7)	113 (81.3)
Do you feel tired all the time?	50 (36.0)	89 (64.0)
Do you have trouble thinking clearly?	46 (33.1)	93 (66.9)
<b>Depressive thinking</b>		
Do you feel unable to play a useful role in your life?	21 (15.1)	118 (84.9)
Have you lost interest in things?	51 (36.7)	88 (63.3)
Have you entertained thoughts of ending your own life?	9 (6.5)	130 (93.5)
Do you feel like a useless, worthless person?	17 (12.2)	122 (87.8)

Source: Prepared by the authors

A team was organized through the project (head office) to welcome and monitor workers via telecare (due to the sanitary restrictions instituted during the pandemic). Additionally,

**THE MENTAL HEALTH AND THE WORK OF ENDEMIC DISEASE  
CONTROL AGENTS IN THE COVID-19 PANDEMIC**

meetings were held with researchers, psychologists, union representatives, and workers to welcome and discuss issues related to mental health and work in the context of the pandemic.

## **DISCUSSION**

Primary Health Care (PHC) has a workforce of approximately 59,000 VCW throughout Brazil. During the pandemic, they were considered essential workers in the fight against COVID-19 (10). Nonetheless, in many municipalities, they were not considered a preferential group for vaccination, leaving it up to local managers to indicate them as a priority (11).

According to Meirelles et al. (12), the advance of the pandemic could characterize a situation of more significant harm to this population. Chronic diseases and the immunocompromised condition manifested by several VCW due to continuous exposure to toxic substances added to the unhealthy conditions of the workplace and other forms of precariousness make these workers more susceptible to infectious diseases, such as COVID-19.

Thus, Fiocruz, through the Center for Studies on Worker Health and Human Ecology (CESTEH), released a technical note (13) recommending that immunocompromised workers remain socially distanced and work remotely to reduce the risk of infection.

In this context, the study showed that 43.2% of the VCW presented symptoms indicative of CMD, and even adopting a higher cut-off value (7/8), this percentage was higher when compared to the first Brazilian study with VCW from the state of Ceara, with a prevalence of 33.3% of CMD (14). Research performed with similar occupational populations, such as community health agents and rural workers exposed to pesticides, presented prevalence of around 34% (1).

Although the use of pesticides decreased in the first year of the pandemic due to isolation, the use of these substances in public health actions is a critical point in the work of VCW. It reflects a chemical-dependent policy to combat arboviruses, which has already proved ineffective, as it induces resistance in vectors and causes harm to human health and the environment (7, 15). The analysis of 109 death certificates of endemic disease agents (2013-2017)

**THE MENTAL HEALTH AND THE WORK OF ENDEMIC DISEASE  
CONTROL AGENTS IN THE COVID-19 PANDEMIC**

reveals this scenario. The workers died at an average age of 55, of which 75% were still of working age <sup>(7)</sup>.

Exposure to pesticides is one of the leading causes of illness among rural workers, with evidence in the literature of an increase in the incidence of cancer <sup>(16, 17)</sup>, endocrine <sup>(17)</sup>, neurological <sup>(18)</sup> diseases, as well as depression and suicide, the latter especially related to neurotoxic substances, such as organophosphates <sup>(19, 18)</sup>. Regarding the mental health of VCW, the study by Bastos et al., <sup>(20)</sup> based on the study of records of these workers in Ceara, indicated that mood disorders accounted for 18.6 DALYs (disability-adjusted life years) and were responsible for almost 20 years of work lived with disability.

This research made it possible to analyze the complaints perceived before the pandemic, which were significantly associated with CMD, suggesting that the demand in the mental health field predates the period analyzed. Among the complaints, sleep disorders stand out, pointed out by VCW (in meetings and discussion forums), as recurrent in the category, not restricted to the pandemic context. These data corroborate Santos's <sup>(21)</sup> results on the characteristics of sleep quality, circadian rhythm, and prevalence of self-reported diseases by VCW in the state of Rio de Janeiro. The analysis identified that the population presented an unhealthy sleep quality, around 5 to 6 hours per night. These data were mainly associated with the mental health of women and were more frequent among those with worse sleep quality. In addition, women presented worse quality of sleep compared to men at all levels evaluated, especially in the use and frequency of sleeping pills.

Mental disorders are generally associated with issues of gender, income, lower levels of education <sup>(22)</sup>, and workers subjected to high demands with little autonomy in performing tasks and organizing work <sup>(22,23)</sup>. However, such issues are irremovable in the context of social and health inequalities.

From the perspective of the social determination of health-disease processes, health needs to be understood from the dimension of the exploitative relations surrounding social classes, considering the scope of the collective and the historical-social aspect of this process. From this perspective, 'health' is understood as a human phenomenon, not limited to a biological or natural issue, and this occurs because the different classes construct their social reproduction through

**THE MENTAL HEALTH AND THE WORK OF ENDEMIC DISEASE  
CONTROL AGENTS IN THE COVID-19 PANDEMIC**

interactions and characteristics linked to race, power, and gender, and it is from these relations that the forms of collective life are structured <sup>(24)</sup>.

The social, political, economic, and work situation experienced during the pandemic has amplified the suffering of workers, mainly due to the fear of exposure and infection by the new coronavirus, the difficulty in working on the streets during a period of restrictions, shortage of personal protective equipment (PPE), and the lack of training and information to deal with the pandemic. Among the VCW who reported suicidal ideation, more than 75% were on the streets as field agents and received the lowest incomes (1-2 minimum wages).

Dejours <sup>(25)</sup> discusses that the amplification of fear occurs due to ignorance of the limits of risks or the lack of knowledge about effective methods, resulting in what he calls the “fear multiplication coefficient,” related to the mental or psychic cost of working when facing the unknown.

“Pathological suffering emerges when the subjective relationship with work is blocked, and the subject has exhausted all attempts to adapt to the organization. A struggle against a force linked to the work organizations that push the subject towards decompensation (mental or psychosomatic) and illness.” <sup>(26)</sup> (p. 201).

Another important aspect observed during the pandemic and in the implementation of restrictive measures was the concern of organizations and health services with the increase in alcoholism, smoking, and use of psychotropic drugs, especially among those who presented greater work intensity and overload <sup>(27)</sup>. In situations of disasters, conflicts, and health emergencies, the consumption of cigarettes and alcoholic beverages can act as mediators of conflicts, suffering, and anguish, as well as the use of psychotropic drugs <sup>(27, 28)</sup>. In this sense, Alves et al. <sup>(28)</sup> point out that prescriptions of this type of medication become a reference for the management of suffering labeled as pathology, even if this is compatible with the social moment and the experience of each subject.

Although the study did not have gender analysis as its main scope, significant differences between men and women were observed, even in a predominantly male category. For Martins et al. <sup>(29)</sup>, in a “society marked by gender discrimination and inequalities, such as Brazil, the exercise of care is still strongly associated with the figure of women.” The social construction of

**THE MENTAL HEALTH AND THE WORK OF ENDEMIC DISEASE  
CONTROL AGENTS IN THE COVID-19 PANDEMIC**

care associated with the female figure imposes a physical and mental overload on women, creating conditions for illness.

In the spaces created for welcoming, discussions, and dialogues about the impact of the pandemic on workers' mental health (held after the questionnaires were applied), issues of emotional overload, and the multiple tasks performed by women (mothers, daughters, caregivers, homemakers, and workers) became evident. On the other hand, men reported difficulties in dealing with internal conflicts, expressing emotions, and recognizing their weaknesses, reporting that emotions manifested in harsher speech and a lack of dialogue. "Those who suffer the most are our partners," reported a VCW.

The workers' statements in the discussion forums also revealed the presence of different psychosocial issues related to work, such as persistent conflicts in the organization of work and the experience of moral harassment. Despite facing difficulties in what was understood as a syndemic, the workers developed strategies to minimize the effects of distancing themselves from family and friends, maintaining a socio-affective and religious network, and supporting the community. For Czeresnia <sup>(30)</sup>, the broader, symbolic dimension of "health as a power to deal with existence" is ignored by restricting health to the absence of disease. From this perspective, health relates to other aspects, such as vitality and well-being. This understanding of health brings about a transformation in practice. The pandemic, therefore, brought back opportunities to reestablish ties with the socio-affective support network, even if it was not through physical contact.

Working conditions and processes were a key element of discussions in the workers' forums and the research group and were an important indicator in investigating the relationship between the health and work of VCW. The work process, working in an adverse context, the illness and death of workers during the pandemic, and the difficulty of dealing with losses aroused feelings of anguish and hopelessness in the face of the new reality. The development of the research became an important action in the field of workers' health, not only identifying issues related to mental health but also allowing for concrete intervention at a time when mental health was experiencing the diametric effects of the pandemic. At a time when health services were not organized to accommodate exponential demand, even today, they are facing the challenge of dealing with the effects of long COVID.



**THE MENTAL HEALTH AND THE WORK OF ENDEMIC DISEASE  
CONTROL AGENTS IN THE COVID-19 PANDEMIC**

### **FINAL CONSIDERATIONS**

Although the work of VCW is linked to the history of public health in Brazil, studies on the category are still incipient in the country, and there is little comparative data. Despite being a predominantly male class, the research identified differences in the effects of the pandemic on the mental health of women, as well as of workers who had to work to combat COVID-19 – the most extensive health emergency experienced. Despite the adverse situation, workers sought strategies to deal with the challenges imposed, demonstrating that health is, above all, a daily struggle, more than simply the absence of illness.

The precariousness of work and the performance in this syndemic context were important references for the investigation of the health of VCW, in addition to providing an opportunity to identify the demands of these workers in the mental health field. Thus, worker health surveillance enables practical actions to protect health, providing data that help to build policies and actions capable of positively transforming the work process.

The pandemic period has added different challenging issues to the lives and work of VCW. However, it was possible to notice that the demand for mental health for these professionals predates the pandemic, especially sleep disorders. Thus, given the exposure to pesticides, it becomes vitally important to monitor these workers, in addition to modifying the chemical-dependent model of combating endemic diseases, since the pesticides used have potential effects on workers' health.

Finally, the analysis of working and health conditions from the perspective of the Expanded Research Community enabled the implementation of more diligent actions in the area of mental health, carried out in real-time during the research, which were feasible in the first year of the COVID-19 pandemic.

### **STUDY LIMITATIONS**

Because this was an online questionnaire, it limited worker participation. Only those who had access to the internet via cell phones or computers were able to participate. It is important to consider the “healthy worker effect,” which may underestimate health problems since active workers would be healthier and fitter for work when observed in the context of the pandemic.

**THE MENTAL HEALTH AND THE WORK OF ENDEMIC DISEASE  
CONTROL AGENTS IN THE COVID-19 PANDEMIC**

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## **REFERENCES**

1. Coledam DHC, Alves TA, Arruda GA de, Ferraiol PF. Prevalence of common mental disorders among Brazilian workers: systematic review and meta-analysis. *Ciênc Saúde Coletiva* [Internet]. 2 de fevereiro de 2022 [citado 4 de novembro de 2024]; :579–91. Disponível em: <https://www.scielo.br/j/csc/a/YSZpPDp5xNtxbCGWMjBBGpp/?lang=en>
2. Goldberg DP, Huxley P. *Common mental disorders: A biosocial model*. New York, NY, US: Tavistock/Routledge; 1992. xvi, 194 p. (*Common mental disorders: A biosocial model*).
3. Santos KOB, Araújo TM de, Pinho P de S, Silva ACC. Avaliação de um instrumento de mensuração de morbidade psíquica: estudo de validação do Self-Reporting Questionnaire (SRQ-20). *Rev Baiana Saúde Pública* [Internet]. 2010 [citado 14 de agosto de 2023];34(3):544–544. Disponível em: <https://rbsp.sesab.ba.gov.br/index.php/rbsp/article/view/54>
4. Gonçalves DM, Stein AT, Kapczinski F. Avaliação de desempenho do Self-Reporting Questionnaire como instrumento de rastreamento psiquiátrico: um estudo comparativo com o Structured Clinical Interview for DSM-IV-TR. *Cad Saúde Pública* [Internet]. fevereiro de 2008 [citado 1º de julho de 2022];24(2):380–90. Disponível em: [http://www.scielo.br/scielo.php?script=sci\\_arttext&pid=S0102-311X2008000200017&lng=pt&tlng=pt](http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0102-311X2008000200017&lng=pt&tlng=pt)

**THE MENTAL HEALTH AND THE WORK OF ENDEMIC DISEASE  
CONTROL AGENTS IN THE COVID-19 PANDEMIC**

5. Talevi D, Socci V, Carai M, Carnaghi G, Faleri S, Trebbi E, et al. Mental health outcomes of the CoViD-19 pandemic. Riv Psichiatri [Internet]. 2020 [citado 29 de agosto de 2022]; (2020 May-June):137–44. Disponível em: <https://doi.org/10.1708/3382.33569>
6. Lotta G, Fernandez M, Magri G, Mello CA de C, Corrêa MG, Rocha MC, et al. Fiocruz. 2021 [citado 13 de agosto de 2022]. Nota técnica: A Pandemia de Covid-19 e (os)as profissionais de saúde pública (4ª Fase). Disponível em: <https://portal.fiocruz.br/documento/nota-tecnica-pandemia-de-covid-19-e-osas-profissionais-de-saude-publica-4a-fase>
7. Larentis AL, Carvalho LVB de, Gonçalves ES, Figueiredo VO, Vidal PJ da SR, Silveira GR da, et al. Adoecimento e mortes de agentes de combate às endemias no estado do Rio de Janeiro expostos a agrotóxicos: crítica ao processo de trabalho e construção coletiva de estratégias de enfrentamento. Em: Saber operário, construção de conhecimento e a luta dos trabalhadores pela saúde. 1º ed São Paulo: Hucitec Editora; 2021. p. 164–201.
8. Oddone I, Marri G, Gloria S, Briante G, Chiatella M, Re A, organizadores. Ambiente de trabalho: a luta dos trabalhadores pela saúde. 2º ed. São Paulo, SP: Hucitec Editora; 2020. 291 p.
9. Brasil. Presidência da República [Internet]. Diário Oficial da União. Seç. 1, Lei nº 11.350, de 5 de outubro de 2006 out 6, 2006 p. 1. Disponível em: [http://www.planalto.gov.br/ccivil\\_03/\\_ato2007-2010/2009/lei/111947.htm](http://www.planalto.gov.br/ccivil_03/_ato2007-2010/2009/lei/111947.htm)
10. Brasil. Secretaria de Atenção Primária à Saúde. 2020 [citado 17 de março de 2023]. ACS e ACE são fundamentais no combate à Covid-19. Disponível em: <https://aps.saude.gov.br/noticia/9996>
11. Antunes A. Escola Politécnica de Saúde Joaquim Venâncio. 2021 [citado 17 de março de 2023]. PL que reconhece ACS e ACE como profissionais de saúde vai ao Plenário da Câmara. Disponível em: <https://www.epsjv.fiocruz.br/noticias/reportagem/pl-que-reconhece-acs-e-ace-como-profissionais-de-saude-vai-ao-plenario-da-camara>
12. Meirelles LC, Carvalho LVB de, Santos MVC dos, Rosa A, Figueiredo V, Vidal P, et al. Agentes de combate às endemias: uma população em risco no enfrentamento da Covid-19. Em: Covid-19: desafios para a organização e repercussões nos sistemas e serviços de saúde [online] [Internet]. 23º ed Rio de Janeiro, RJ: Fiocruz; 2022 [citado 13 de agosto de 2022]. p. 321–33. (Série Informação para ação na Covid-19). Disponível em: <https://books.scielo.org/id/kymhj>
13. Centro de Estudos da Saúde do Trabalhador e Ecologia Humana. Nota Técnica Cesteh/Ensp/Fiocruz. Agentes de combate as endemias, uma população em risco frente à COVID-19 [Internet]. Cesteh; 2020 [citado 12 de outubro de 2022]. Disponível em: <http://www.sintsauderj.org.br/noticia/covid19-fiocruz-divulga-nota-tecnica-contra-trabalho-de-campo-de-agente-de-combate-as-endemias>

**THE MENTAL HEALTH AND THE WORK OF ENDEMIC DISEASE  
CONTROL AGENTS IN THE COVID-19 PANDEMIC**

14. Bastos MLA, Marcos Clint Leal de Carvalho, Freitas TH, Junior GB da S. Common mental disorders among workers chronically exposed to pesticides: the case of workers involved in fighting endemic diseases. *Rev Bras Med Trab* [Internet]. 2019 [citado 1º de julho de 2022];17(4):506–10. Disponível em: <http://www.rbmt.org.br/details/485/en-US/common-mental-disorders-among-workers-chronically-exposed-to-pesticides--the-case-of-workers-involved-in-fighting-endemic-diseases>
15. Bardach AE, García-Perdomo HA, Alcaraz A, Tapia López E, Gándara RAR, Ruvinsky S, et al. Interventions for the control of *Aedes aegypti* in Latin America and the Caribbean: systematic review and meta-analysis. *Trop Med Int Health* [Internet]. 2019 [citado 14 de abril de 2024];24(5):530–52. Disponível em: <https://onlinelibrary.wiley.com/doi/abs/10.1111/tmi.13217>
16. INCA. Ambiente, trabalho e câncer: Aspectos epidemiológicos, toxicológicos e regulatórios [Internet]. Rio de Janeiro: Instituto Nacional de Câncer José Alencar Gomes da Silva; 2021. 293 p. Disponível em: <https://ninho.inca.gov.br/jspui/handle/123456789/4836>
17. Friedrich K, Silveira GRD, Amazonas JC, Gurgel ADM, Almeida VESD, Sarpa M. Situação regulatória internacional de agrotóxicos com uso autorizado no Brasil: potencial de danos sobre a saúde e impactos ambientais. *Cad Saúde Pública* [Internet]. 2021 [citado 24 de maio de 2024];37(4):e00061820. Disponível em: [http://www.scielo.br/scielo.php?script=sci\\_arttext&pid=S0102-311X2021000405015&tlng=pt](http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0102-311X2021000405015&tlng=pt)
18. Robb EL, Regina AC, Baker MB. Organophosphate Toxicity. Em: *StatPearls* [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 [citado 18 de fevereiro de 2024]. Disponível em: <http://www.ncbi.nlm.nih.gov/books/NBK470430/>
19. Zúñiga-Venegas LA, Hyland C, Muñoz-Quezada MT, Quirós-Alcalá L, Butinof M, Buralli R, et al. Health Effects of Pesticide Exposure in Latin American and the Caribbean Populations: A Scoping Review. *Environ Health Perspect* [Internet]. 29 de setembro de 2022 [citado 14 de abril de 2024];130(9):096002. Disponível em: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9521041/>
20. Bastos MLA, Carvalho TGS de, Ferreira MJM. Global burden of mental illness in agents fighting endemics. *Cad Saúde Pública* [Internet]. 2022 [citado 5 de outubro de 2022];38(2):e00157921. Disponível em: [http://www.scielo.br/scielo.php?script=sci\\_arttext&pid=S0102-311X2022000206001&tlng=en](http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0102-311X2022000206001&tlng=en)
21. Santos MVC dos. Avaliação da qualidade do sono, biomarcadores de efeito e condições da exposição em guardas de endemias do estado do Rio de Janeiro expostos a agrotóxicos [Internet] [Tese]. [Rio de Janeiro]: Escola Nacional de Saúde Pública Sergio Arouca. Fundação Oswaldo Cruz; 2022 [citado 1º de maio de 2023]. Disponível em: <https://www.arca.fiocruz.br/handle/icict/57292>

**THE MENTAL HEALTH AND THE WORK OF ENDEMIC DISEASE  
CONTROL AGENTS IN THE COVID-19 PANDEMIC**

22. Grapiglia CZ, Costa JSD da, Pattussi MP, Paniz VMV, Olinto MTA. Fatores associados aos transtornos mentais comuns: estudo baseado em clusters de mulheres. *Rev Saúde Pública* [Internet]. 22 de novembro de 2021 [citado 19 de dezembro de 2022]; 55:77. Disponível em: <https://www.revistas.usp.br/rsp/article/view/193414>
23. Centenaro APFC, Andrade AD, Franco GP, Cardoso LS, Spagnolo LMDL, Silva RMD. Transtornos mentais comuns e fatores associados em trabalhadores de enfermagem de unidades COVID-19. *Rev Esc Enferm USP* [Internet]. 2022 [citado 24 de agosto de 2023];56:e20220059. Disponível em: [http://www.scielo.br/scielo.php?script=sci\\_arttext&pid=S0080-62342022000100471&tlng=pt](http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0080-62342022000100471&tlng=pt)
24. Nogueira RP, organizador. *Determinação social da saúde e reforma sanitária*. Rio de Janeiro, Brazil: Cebes, Centro Brasileiro de Estudos de Saúde; 2010. 200 p. (Coleção Pensar em saúde).
25. Dejours C. *A loucura do trabalho: estudo de psicopatologia do trabalho*. 5. ed. ampl. São Paulo: Cortez Oboré; 2008.
26. Amorim WL, Carvalho AFM, Leão RV. Estratégias defensivas contra o sofrimento psíquico entre trabalhadores. *Fractal Rev Psicol* [Internet]. 11 de fevereiro de 2022 [citado 29 de setembro de 2022]; 33:199–204. Disponível em: <http://www.scielo.br/j/fractal/a/zfsW7pSznZXPtWThDPzq8Jg/?lang=pt>
27. Malta DC, Gomes CS, Souza Júnior PRB de, Szwarcwald CL, Barros MB de A, Machado ÍE, et al. Fatores associados ao aumento do consumo de cigarros durante a pandemia da COVID-19 na população brasileira. *Cad Saúde Pública* [Internet]. 7 de abril de 2021 [citado 3 de janeiro de 2023];37. Disponível em: <http://www.scielo.br/j/csp/a/Ldk3Ppq7Q4bSHt4TmthTyKh/?lang=pt>
28. Alves AM, Couto SB, Santana M de P, Baggio MRV, Gazarini L. Medicalização do luto: limites e perspectivas no manejo do sofrimento durante a pandemia. *Cad Saúde Pública* [Internet]. 15 de outubro de 2021 [citado 5 de janeiro de 2023];37:e00133221. Disponível em: <https://www.scielosp.org/article/csp/2021.v37n9/e00133221/#>
29. Martins AM, Gazzinelli AP, Almeida SSL de, Modena CM. A assistência psicológica aos homens com câncer: reflexões na perspectiva de gênero. *Rev SBPH* [Internet]. Junho de 2013 [citado 13 de agosto de 2022];16(1):49–69. Disponível em: [http://pepsic.bvsalud.org/scielo.php?script=sci\\_abstract&pid=S1516-08582013000100004&lng=pt&nrm=iso&tlng=pt](http://pepsic.bvsalud.org/scielo.php?script=sci_abstract&pid=S1516-08582013000100004&lng=pt&nrm=iso&tlng=pt)
30. Czeresnia D, Maciel EMG de S, Malagón RA. *Os sentidos da saúde e da doença*. Rio de Janeiro: FIOCRUZ; 2013. 119 p. (Coleção Temas em saúde).

**THE MENTAL HEALTH AND THE WORK OF ENDEMIC DISEASE  
CONTROL AGENTS IN THE COVID-19 PANDEMIC**

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**THE MENTAL HEALTH AND THE WORK OF ENDEMIC DISEASE  
CONTROL AGENTS IN THE COVID-19 PANDEMIC**

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