Comorbities and mental health among healthcare workers in Brazil. The impact of the COVID-19 pandemic

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Abstract *This is an original article that addresses the healthcare workforce (HW) in Brazil, as well as comorbidities and mental health changes during the COVID-19 pandemic. This study was conducted by the Oswaldo Cruz Foundation and collected data through an online questionnaires from a total of 36,612 participants, health professionals (HP, with higher education level), and invisible healthcare workers (IHW, with a technical mid-level education). The overall prevalence of comorbidities in Brazil was 26.1% and 23.9%; the highest was arterial hypertension (27.4% and 31.9%), followed by obesity (18.4% and 15.1%), chronic respiratory diseases (15.7% and 12.9%), diabetes mellitus (10.3% and 10.4%), and depression/anxiety (9.1% and 11.7%), in the HW and IHW, respectively. The region with the highest frequency was the southeast, where the largest contingent of workers is located. The HW, affected with a high burden of non-communicable chronic diseases and exposed to SARS-CoV-2, proved to be vulnerable to illness and death. Mental symptoms and intense psychological suffering have been reported. These results allow us to estimate the impacts upon physical and mental health, as well as upon living and working conditions of the HW. The health and life of workers, leading role in facing health challenges of the pandemic, are a high priority in public policies.*

Key words *Health worker, Health professional, Comorbidity, COVID-19, Brazil*

Introduction

When the World Health Organization (WHO) declared COVID-19 to be a pandemic in March 2020, a serious public health problem hit the world with a devastating punch and tragically changed people's lives. Brazil was one of the epicenters. By September 2022, COVID-19 had affected 600 million people and claimed 6 million lives. Brazil ranked 3rd in such cases, with more than 35 million, and 2nd in deaths, around 700,000[1]. However, there were estimates of triple deaths, "due to the direct and indirect effect of the pandemic", with Brazil in 5th place, preceded by India, USA, Russia, and Mexico[2]. Having to cope with so much suffering on a daily basis exposed the already weakened living conditions of healthcare workers[3].

Several studies have identified factors associated with a higher risk of illness, developing severe forms of the disease, hospitalization – including treatment in an intensive care unit (ICU) – and death. Scarcity and inadequate personal protective equipment (PPE), insufficient training, and massive exposure to SARS-CoV-2 resulted in high morbidity and mortality in the healthcare workforce (HW). In a meta-analysis of 21,060 patients, the variables associated with contracting a more severe form of the disease were: male sex, advanced age, smoking, obesity, systemic arterial hypertension (SAH), coronary disease, chronic disease (kidney, liver, or cerebrovascular), chronic respiratory disease (CRD), diabetes mellitus (DM), and cancer[4].[1] There is evidence that the severity is even greater if there are concomitant comorbidities and that COVID-19 has the potential to trigger new diseases, such as DM. Despite the short time elapsed to assess the medium and long-term repercussions, "long-term COVID-19" has been described, which can affect up to half of the patients, even if they have contracted a mild form. It is a systemic syndrome that demands multidisciplinary care and has a profound impact on people's lives and on the exhausted healthcare system[5], due to the chronicity of symptoms and loss of quality of life among the elderly, a high body mass index (BMI), smokers, the presence and number of comorbidities, invasive mechanical ventilation, a low level of education, and unemployment[6].

The mental health of the world's population, especially that of the HW, is a global challenge that now includes COVID-19. Successive absences due to illness aggravated the burden of those who remained on the front lines. Fear, inse-curity, and mourning surrounded the daily lives of those who went from home to healthcare units with precarious conditions. Workers' lives were at stake. The WHO and the United Nations (UN) listed health as one of the seventeen sustainable development goals in the 2030 Agenda for Sustainable Development. It has been estimated that depression could be the most prevalent illness in the adult population by 2030. Special attention is drawn to the occurrence of suicide in the HW. In a study of doctors, 20% knew colleagues who had considered, attempted, or died by suicide during the pandemic, and many of them reviewed their professional choice[7].

An agile and transparent information system is essential to diagnosing reality and effective interventions. Successive blackouts in Brazil concealed the reality of illness and death among the population. The real world was replaced by false data.

Motivated by these issues, the authors of this study searched for cases and deaths on the platforms of the federal government and the 27 states, but in vain. Epidemiological bulletins[8] of the group of workers were found (with their occupation being added later)[9]. This recently published study estimated COVID-19-related deaths in Brazil in the core professions: physicians and nursing staff. By October 2021, out of 1,766 deaths, 50.6%, 36.3%, and 17.5% were doctors, assistants/technicians, and nurses, respectively[10].

Brazil's robust Unified Health System (SUS) was responsible for handling relevant cases, with more than 200,000 units and 430,000 beds, together with 4 million direct jobs, half of which were doctors and nursing staff. Funding for SUS worsened during the most critical years of the pandemic, proving to be an obstacle to containing the spread of the disease. Were it not for the efforts of the HW, the outcome would have been even more tragic. The pandemic reached Brazil when poverty, inequality, and unemployment were on the rise and environmental policies were neglected, creating a fertile environment of vulnerability. The obscurantist vision concealed evidence produced by the researchers' committed efforts as best it could. Publications were gradually being released, with free access to the platforms.

Motivated by such a severe health crisis, Fiocruz developed a research plan. This article aimed to analyze the most prevalent living and health conditions of healthcare workers, any pre-existing comorbidities self-reported by participants in the online questionnaire, and mental health complaints stemming from the pandemic.

Method

This is an original article using data from two surveys: "Working Conditions of Health Professionals in the Context of Covid-19 in Brazil", conducted with professionals with higher education[11], and "Invisible healthcare workers: working conditions and mental health in the context of Covid-19 in Brazil", involving technical-level workers without specific healthcare training[12]. The surveys were coordinated by the Center for Strategic Studies of the National School of Public Health of the Oswaldo Cruz Foundation (CEE/ENSP/FIOCRUZ) and were disseminated through social networks, institutional contacts, and healthcare worker organizations. These are nationwide, cross-sectional surveys involving professionals and workers who were in the frontline in the fight against the COVID-19 pandemic in Brazil. For more information on the method, access article one of this special issue, "Transformations in the world of healthcare work: workers and future challenges". Both surveys were approved by the Research Ethics Committee/Fiocruz (Opinion No. 4.081.914 CAAE No. 32351620.1.0000.5240).

The database was constructed from an online questionnaire using the Research Electronic Data Capture (RedCap) platform. Responses were stored on the server of Fiocruz's Institute of Communication and Scientific and Technological Information in Health (*Instituto de Comunicação e Informação Científica e Tecnológica em Saúde* - ICICT). Non-probabilistic snowball sampling used the actors' social networks to access the target audience of each survey so that the choice of participants did not follow a random model. It was a self-completed questionnaire with free distribution.

Participants completed the online questionnaire that presented closed questions with eight non-excluding options to be marked: "high blood pressure, obesity, diabetes, collagenosis, depression, heart disease, lung (respiratory) disease, and chronic kidney disease". A ninth item, "others", was made available for a write-in description. When analyzing the results, a considerable and dispersed frequency of responses was identified in the "others" item, which was then revised with some changes: when relevant, diseases described in the "others" option were added to one of the eight existing ones, and when they were not relevant, new ones were created (e.g., neurological disease), totaling 20 comorbidities. The "others" option was kept to ensure the widest possible coverage. Mental health was assessed through closed questions that addressed significant changes in daily life generated by the COVID-19 pandemic, such as sleep disturbance, irritability, stress, difficulty concentrating or slow thinking, loss of career or life satisfaction, sadness and apathy, and increased use of medication, alcohol, energy drinks, and cigarettes. Specific scales for depression and anxiety were not used, in addition to general questions about the experience of illness contained in the questionnaire. The results were stored in ICIT and analyzed in Microsoft Excel programs using simple frequency and odds ratio (OR) and their 95% confidence intervals (95%CI).

Results

Of a total of 36,612 participants, the prevalence of comorbidity was 26.1% and 23.9%, the highest being in the Southeast, as shown in Table 1. The association between comorbidity and sex was observed in PS men (OR=1.4), in black TI (OR=1.2), and in older age groups in both, as

Table 1. Prevalence of comorbidities in healthcare professionals* and invisible healthcare workers**. Brazil and regions, 2020/2022.

Brazil and regions	Healthcare professionals (%)	Invisible healthcare workers (%)
Brazil	26.1	23.9
North	24.3	19.9
Northeast	24.0	25.4
Southeast	29.2	26.1
South	24.4	24.0
Midwest	23.7	20.3

*Doctor, Nurse, Physiotherapist/Occupier, Dentist, Biomedical, Pharmacist, Psychologist, Assistant social worker, Nutritionist, Speech therapist, Biologist, Veterinarian, Hospital administrator, Physical education, Engineer/work safety/sanitary specialist. **Nursing Tech./Aide. and Oral health/Dental prosthesis, Pharmacy/Hemotherapy/Clinical analysis Tech./Aide., Technologist/Tech./Aide. in radiology, Tech. in orthopedic immobilization, work safety, and health surveillance; Health agent and indigenous health/sanitation; Stretcher bearer; Ambulance driver; Mortician; Hospital kitchen; Administrative, Doorman/receptionist/telephone operator/security; Cleaning, conservation, and maintenance.

Source: Research "Work Conditions of Health Professionals in the Context of COVID-19 in Brazil", and research "Invisible healthcare workers: working conditions and mental health in the context of COVID-19 in Brazil" - ENSP-CEE/FIOCRUZ, 2020/2022.

shown in Table 2. The most prevalent comorbidity was systemic arterial hypertension (SAH) (27.4% and 31.9%), followed by obesity (18.4% and 15.1%), CRD (15.7% and 12.9%), DM (10.3% and 10.4%), and depression/anxiety (9.1% and 11.7%), in PS and IT, respectively, except for depression/anxiety, which ranked 4th in IT and 5th in DM. The factors associated with comorbidities in PS were men with SAH and DM, age group (≥36 years) with SAH, obesity and DM, and mixed race with DM. In TI, there was an association between women and SAH, obesity and CRD, age group (≥36 years) and SAH, DM and obesity, and black race with SAH and DM. Depression/anxiety occurred mainly in women. The most prevalent comorbidities, associated factors, and distribution are shown in Table 3.

As Brazil is a vast country with significant epidemiological, ethnic, and climatic diversity, evaluating each region is of paramount importance. The most frequent comorbidities were also found in all five regions, with alternations in their ranking due to small fluctuations in frequency. Obesity and SAH are the most widely prevalent in Brazil and found in all regions, except in the South (with obesity in 3rd place in the PS). The North has the highest CRD in the IT (18.1%) and in the Northeast, SAH (29.3% in the PS and 34.9% in the IT), obesity (20.3% in the PS), and is ranked second for depression/anxiety (12.6% in IT). In the Southeast, where the largest number of HW is located, there is a high frequency of SAH (27.3% and 31.4%) and obesity (18.5% and 16.3%), PS and IT, respectively. Depression/anxiety was higher in IT in the Northeast and South, which proved to be twice as high as in the North. Table 4 shows the most prevalent comorbidities and their distribution among healthcare professionals and invisible workers in Brazil's five regions.

In addition to identifying comorbidities, the results of this study made it possible to evaluate complaints related to daily life and mental health, more frequently reported in the PS and described as sleep disturbance, irritability and frequent crying, inability to relax and feeling of stress, difficulty concentrating, or slow thinking. In the IT, the loss of satisfaction in life or one's career, sadness and apathy, increased use of medications, alcohol, energy drinks, cigarettes, depression/anxiety, headache, pain, tiredness, fatigue, and discouragement were common complaints. These changes had been present since the beginning of the pandemic in both PS and IT, 53.5% and 65.2%, respectively. Changes in daily life and their frequency are shown in Table 5.

Discussion

The most frequently reported comorbidities were all multifactorial non-communicable diseases (NCDs): genetic, physiological, environmental, and behavioral, which disproportionately affected low and middle-income countries, such as Brazil, as observed in this study. The prevalence of NCDs is similar to that estimated in the Brazilian population aged 18 years or over by the "Surveillance System for Risk and Protective Factors for Chronic Diseases by Telephone Survey" (Vigitel)[13], which monitors the frequency and distribution of their principal determinants.

SAH and obesity, the most frequently reported in Brazil and in almost all regions in the PS and TI, together have the potential to generate

Table 2. Comorbidity by sex. age group. and color in healthcare professionals and invisible healthcare workers. Brazil. 2020/2022.

	Comorbidity (%) OR (95%CI)	
	Healthcare professionals*	Invisible healthcare workers**
Sex		
Female	24. 5 [1.00]	26.0 [1.00]
Male	31.9 [1.4 (1.3-1.7)]	19.8 [0.7 (0.7-0.8)]
Age range (in years)		
<25	14.1 [1.00]	13.0 [1.00]
25-35	17.4 [1.3 (1.0-1.6)]	15.4 [1.2 (1.03-1.4)]
36-50	25.9 [2.1 (1.7-2.6)]	25.2 [2.2 (1.9-2.6)]
51-60	42.4 [4.5 (3.6-5.6)]	41.6 [4.8 (4.0-5.6)]
>61	61.1 [9.6 (7.4-12.5)]	49.6 [6.6 (5.1-8.4)]
Color		
White	28.0 [1.00]	24.2 [1.00]
Black	25.2 [0.86 (0.7-1.0)]	28.2 [1.2 (1.1-1.4)]
Brown	27.3 [0.96 (0.8-1.2)]	19.8 [0.78 (0.6-0.99)]
Yellow	22.9 [0.7 (0.7-0.8)]	23.9 [0.98 (0.9-1.1)]
Indigenous	29.0 [1.05 (0.5-2.3)]	17.5 [0.7 [(0.4-1.1)]

OR=odds ratio. 95%CI=95% confidence interval. *Doctor, Nurse, Physiotherapist/Occupier, Dentist, Biomedical, Pharmacist, Psychologist, Assistant social worker, Nutritionist, Speech therapist, Biologist, Veterinarian, Hospital administrator, Physical education, Engineer/work safety/sanitary specialist. **Nursing Tech./Aide. and Oral health/Dental prosthesis, Pharmacy/Hemotherapy/Clinical analysis Tech./Aide., Technologist/Tech./Aide. in radiology, Tech. in orthopedic immobilization, work safety, and health surveillance; Health agent and indigenous health/sanitation; Stretcher bearer; Ambulance driver; Mortician; Hospital kitchen; Administrative, Doorman/receptionist/telephone operator/security; Cleaning, conservation, and maintenance.

Table 3. Comorbidities by sex, age group and color. Healthcare professionals and invisible healthcare workers. Brazil, 2020/2022.

	AHS (%) OR (CI)	Obesity (%) OR (CI)	CRD (%) OR (CI)	DM (%) OR (CI)	Depression/ anxiety (%) OR (CI)
Healthcare professionals*					
Sex					
Female	9.0 (1.00)	6.2 [1.00]	6.5 [1.00]	2.7 [1.00]	4.2 [1.00]
Male	16.5 [2.01 (1.8-2.2)]	10.6 [0.7 (0.6-0.9)]	4.8 [0.7 (0.6-0.8)]	6.3 [2.4 (2.0-2.9)]	3.2 [0.7 (0.6-0.9)]
Age range					
<25	2.1 [1.00]	3.7 [1.00]	6.2 [1.00]	0.3 [1.00]	2.9 [1.00)]
25-35	2.6 [1.2 (0.7-2.1)]	4.9 [1.3 (0.9-2.0)]	5.4 [0.9 (0.6-1.2)]	1.1 [4.3 (1.0-17.6)]	3.8 [1.3 (0.8-2.03)]
36-50	10.3 [5.3 (3.2-8.8)]	8.0 [2.3 (1.5-3.3)]	5.9 [0.9 (0.7-1.3)]	3.0 [11.8 (2.9-47.6)]	4.1 [1.4 (0.9-2.2)]
51-60	26.2 [16.4 (9.9-27.2)]	8.7 [2.5 (1.7-3.7)]	8.2 [1.3 (0.9-1.9)]	8.2 [33.3 (8.2-134.7)]	4.5 [1.6 (0.97-2.5)]
>61	38.6 [29.0 (17.2-48.8)]	14.6 [4.4 (2.9-6.8)]	7.3 [1.2 (0.8-1.8)]	17.2 [77.8 (19.1-316.6)]	4.0 [1.4 (0.8-2.5)]
Colour					
White	11.4 [1.00]	7.5 [1.00]	6.6 [1.00]	3.7 [1.00]	4.8 [1.00]
Black	11.9 [1.05 (0.9-1.3)]	7.1 [0.9(0.7-1.2)]	5.6 [0.8 (0.6-1.1)]	3.6 [0.96 (0.7-1.4)]	3.2 [0.7 (0.4-0.95)]
Bron	10.7 [0.9 (0.7-1.3)]	6.8 [0.9(0.6-1.4)]	6.2 [0.9 (0.6-1.5)]	7.5 [2.1 (1.3-3.2)]	3.2 [0.7 (0.4-1.3)]
Yellow	9.1 [0.8 (0.7-0.9)]	6.6 [0.8(0.8-0.9)]	5.3 [0.8 (0.7- 0.9)]	3.0 [0.8 (0.6-0.96)]	2.8 [0.6 (0.5- 0.7)]
Indigenous	12.9 [1.2 (0.4 - 3.3)]	6.5 [0.9 (0.2-3.6)]	6.5 [0.97 (0.2-4.1)]	0	3.2 [0.7 (0.09-4.9)]
Invisible healthcare workers**					
Sex					
Female	11.7 [1.00]	5.9 [1.00]	5.3 [1.00]	3.6 [1.00]	4.9 [1.00]
Male	10.9 [0.9 (0.8-1.0)]	4.1 [0.7 (0.6-0.8)]	2.7 [0.7(0.4-0.6)]	4.2 [1.2 (1.0-1.4)]	2.2 [0.4 (0.4-0.5)]
Age range					
<25	1.1 [1.00]	2.6 [1.00]	6.2 [1.00]	0.4 [1.00]	3.4 [1.00]
25-35	3.8 [3.6 (2.2- 5.8)]	4.3 [1.6 (1.2 -2.3)]	4.7 [0.7 (0.6-0.9)]	1.3[3.6 (1.5-8.2)]	2.8 [0.8 (0.6-1.2)]
36-50	12.3 [12.6 (7.9-20.1)]	6.0 [2.4 (1.8 -3.2)]	4.4 [0.7 (0.6-0.8)]	3.8 [10.7 (4.8-24.1)]	4.5 [1.4 (1.0-1.8)]
51-60	26.7 [32.6 (20.4-52.3)]	7.4 [2.97 (2.1 -4.2)]	4.7 [0.7 (0.6-0.96)]	9.3 [27.9 (12.4-62.9)]	6.2 [1.9 (1.4-2.6)]
>61	29.8 [38.2 (22.8-63.8)]	3.4 [1.3 (0.7-2.5)]	3.7 [0.6 (0.3-1.0)]	11.3 [34.4 (14.5-81.6)	4.5 [1.3 (0.8-2.3)]
Colour					
White	10.7 [1.00]	6.2 [1.00]	5.2 [1.00]	3.3 [1.00]	5.1 [1.00]
Black	15.1 [1.5 (1.31-1.71)]	6.6 [1.1 (0.9-1.3)]	4.7 [0.9 (0.7-1.1)]	4.8 [1.5 (1.2-1.8)]	4.0 [0.8 (0.6-0.99)]
Bron	10.2 [0.95 (0.6 - 1.3)]	4.3 [0.7 (0.4-1.1)]	4.0 [0.8 (0.5-1.3)]	3.1 [0.9 (0.5-1.6)]	3.6 [0.7 (0.4-1.2)]
Yellow	11.4 [1.1 (0.98-1.2)]	4.7 [0.8 (0.7- 0.9)]	4.3 [0.8 (0.7-0.9)]	3.9 [1.2 (1.01-4.4)]	3.6 [0.7 (0.6-0.8)]
Indigenous	7.0 [0.6 (0.3 - 1.3)]	0.9 [0.1 (0.02-0.95)]	3.5 [0.7 (0.2-1.8)]	4.3 [1.3 (0.5-3.3)]	3.5 [0.7 (0.3-1.8)]

OR=odds ratio. 95%CI=95% confidence interval. *Doctor, Nurse, Physiotherapist/Occupier, Dentist, Biomedical, Pharmacist, Psychologist, Assistant social worker, Nutritionist, Speech therapist, Biologist, Veterinarian, Hospital administrator, Physical education, Engineer/work safety/ sanitary specialist. **Nursing Tech./Aide. and Oral health/Dental prosthesis, Pharmacy/Hemotherapy/Clinical analysis Tech./Aide., Technologist/ Tech./Aide. in radiology, Tech. in orthopedic immobilization, work safety, and health surveillance; Health agent and indigenous health/sanitation; Stretcher bearer; Ambulance driver; Mortician; Hospital kitchen; Administrative, Doorman/receptionist/telephone operator/security; Cleaning, conservation, and maintenance.

morbidity similar to that of high-income countries, with some publications warning of a link between obesity and cancer. The most prevalent comorbidities represent a heavy burden of previous chronic illnesses with recognized vulnerability to illness, severity, and death from COVID-19. Knowing the profile of comorbidities in the healthcare workforce makes it possible to compare risks to those in the adult population and suggest appropriate public policies. The results of this study show:

1. SAH, the most frequently reported in the country's five regions, highest in the Northeast and lowest in the South;

Table 4. Most prevalent comorbidities. Healthcare professionals* and invisible healthcare workers**. Brazil and regions, 2020/2022.

	SAH (%)	Obesity (%)	CRD (%)	DM (%)	Depression/anxiety (%)
Brazil					
Healthcare professionals	27.4	18.4	15.7	10.3	9.1
Invisible healthcare workers	31.9	15.1	12.9	10.4	11.7
North					
Healthcare professionals	28.9	18.3	16.8	10.5	6.4
Invisible healthcare workers	30.9	11.7	18.1	11.9	6.6
Northeast					
Healthcare professionals	29.3	20.3	14.5	9.1	7.8
Invisible healthcare workers	34.9	14.1	9.9	11.1	12.6
Southeast					
Healthcare professionals	27.3	18.5	15.3	9.8	10.2
Invisible healthcare workers	31.4	16.3	13.6	10.9	10.3
South					
Healthcare professionals	24.6	15.7	17.3	6.8	10.2
Invisible healthcare workers	25.8	17.6	16.4	7.3	14.7
Midwest					
Healthcare professionals	25.3	17.3	16.6	7.2	12.8
Invisible healthcare workers	33.6	15.0	11.1	8.0	12.5

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Source: Research "Work Conditions of Health Professionals in the Context of COVID-19 in Brazil", and research "Invisible healthcare workers: working conditions and mental health in the context of COVID-19 in Brazil" - ENSP-CEE/FIOCRUZ, 2020/2022.

2. Obesity, ranked 2nd in four regions, highest in the Northeast and lowest in the South;

3. CRD, the 3rd most frequent in all regions, except in the South where it is ranked 2nd and with the highest frequency, contrasting with the lowest frequency in the Northeast;

4. Depression/anxiety fluctuates between 4th and 5th place, 2nd in the South and lowest in the North;

5. DM fluctuates between 4th and 5th place, highest in the North and lowest in the South.

SAH was the most prevalent in Brazil and in all regions, with the greatest burden in the Northeast. Obesity was more frequent in the Northeast in PS and in the South in IT. CRD was more frequent in PS in the South and in IT in the North, and DM in the North in both. Frequencies in the South, North, and Northeast were similar to each other and to those estimated by Vigitel[13]. This was associated with men in PS, with Blacks in IT, and with older patients in both PS and IT.

SAH is the primary modifiable risk factor for cardiovascular diseases and the leading cause of premature death in the world, affecting 1.28 billion adults aged 30-79 years, 1:4 men and 1:5 women. Half of them are unaware of the diagnosis, and of those who are, half do not receive treatment. Effective control of blood pressure levels is achieved in only around 20%, ranging from 10% to 75% in different countries. Although the percentage of people with SAH grew little from 1990-2019, reaching just over 30%, the absolute number doubled, possibly due to factors such as access to the healthcare system, population growth, and increased life expectancy[14]. There were no substantial changes in global NCD data in 2019 as compared to 2016. The increase in SAH in low and middle-income countries, which accounted for 82% of the cases, is due to an escalation in risk factors in recent decades[15].

The percentages of SAH medical diagnosis in this study were similar to those from Vigitel[13], (19.3% to 32.0%), higher in both sexes with increasing age (3.8% of 18-24 years and 61% above 65 years), and 27.1% and 25.4%, for women and men, respectively.

Table 5. Changes in daily life among healthcare professionals* and invisible healthcare workers**. Brazil, 2020/2022.

Change in daily life	Healthcare Professional (%)	Invisible Healthcare Worker (%)
Sleep disturbance (insomnia or hypersomnia)	15.8	13.0
Irritability/Frequent crying/General disturbances	13.6	6.8
Inability to relax/Stress	11.7	3.6
Difficulty concentrating or slow thinking	9.2	7.2
Loss of career or life satisfaction/Sadness/Apathy	9.1	9.8
Negative feeling of the future/Negative, suicidal thoughts	8.3	3.9
Change in appetite/Weight change	8.1	7.2
Loss of confidence in yourself, the team, or the work done	6.2	4.8
Increased consumption of medications, alcohol, energy drinks, and cigarettes	6.0	7.2
Difficulty experiencing happiness	5.5	3.7
I do not present any significant changes	5.5	4.1
Depression/Anxiety	0.3	9.7
Headache/Aches in general	0.2	6.1
Extreme Exhaustion/Fatigue/Discouragement	0.1	8.8
Fear/Panic	0.1	3.9

*Doctor, Nurse, Physiotherapist/Occupier, Dentist, Biomedical, Pharmacist, Psychologist, Assistant social worker, Nutritionist, Speech therapist, Biologist, Veterinarian, Hospital administrator, Physical education, Engineer/work safety/sanitary specialist. **Nursing Tech./Aide. and Oral health/Dental prosthesis, Pharmacy/Hemotherapy/Clinical analysis Tech./Aide., Technologist/Tech./Aide. in radiology, Tech. in orthopedic immobilization, work safety, and health surveillance; Health agent and indigenous health/sanitation; Stretcher bearer; Ambulance driver; Mortician; Hospital kitchen; Administrative, Doorman/receptionist/telephone operator/security; Cleaning, conservation, and maintenance.

Source: Research "Work Conditions of Health Professionals in the Context of COVID-19 in Brazil", and research "Invisible healthcare workers: working conditions and mental health in the context of COVID-19 in Brazil" - ENSP-CEE/FIOCRUZ, 2020/2022.

The global prevalence of DM is 10.5%, having been unreported by 40%[16]. Brazil ranks 5th in the world and 1st in Latin America (9.2%), with a variation of 6.3% (North) to 12.8% (Southeast). The PS distribution with DM was 6.7% in males and 2.7% in females (OR=2.4). There was a lower prevalence among the TI: 4.2% in men and 3.6% in women (OR=1.17). The present study differs from other studies of the like in that the highest prevalence was found in women. DM increased with age in both sexes, as also shown in the Vigitel[13], and did not change with skin color.

Initial observational studies up to 2020 suggested that age and certain risk factors, such as SAH, obesity, and DM, might be associated with SARS-CoV-2 infection. This assumption was illustrated in 65 observational studies that the risk of admission to an ICU and death in patients with SAH or DM and COVID-19 was higher[17]. In 2021, the WHO suggested that SAH could raise the risk of severe COVID-19, but it later concluded that it was impossible to state whether or not the worst prognosis was also associated with other factors. When analyzing 51 studies, cardio-vascular disease (RR=3.11), SAH (RR=2.50), and DM (RR=2.25) were associated with unfavorable outcomes (ICU admission and death) in patients with COVID-19 in all ages. Although young people are usually found to have fewer comorbidities, the relative risk of a fatal outcome in those with SAH or DM was higher than in the elderly[18].

The importance of diagnosing DM during the COVID-19 pandemic was also due to evidence that chronic hyperglycemia significantly elevated the risk of prolonged hospitalization, serious complications, and higher mortality[19]. However, in some studies, there was no difference in the daily lives of people with or without DM, which is also a slim risk factor for developing "long-term COVID-19".

The prevalence of SAH, DM, and obesity was heterogeneous in the 2020 American Working Group. However, the standardized prevalence of obesity and DM in Brazil between 1980-2014 rose in both sexes, while a decline was observed in SAH[4]. The 2021 NCD Risk Factor Collaboration (NCD-RisC) warned of other determinants, such those related to diet[12]. The Global Burden of

Disease (GBD) quantifies the loss of health due to hundreds of diseases, injuries, and risk factors, and in the 2019 edition, the weighted prevalence of risk factors (systolic blood pressure to estimate SAH and BMI for obesity) identified a significant jump in metabolic factors (1.37%/year from 1990-2019, 1.46%/year from 2010-2019), and 1% of years of life lost due to these diseases.

Vigitel[13] estimated obesity at 22.4%[11]. In the present study, the rise in obesity in the different age groups in PS and up to 60 years in IT, is in line with what was measured by the Vigitel[13], which described obesity increasing with age, notably in women up to 64 years[11]. This study identified OR=4.44 for SP aged over 61 years and OR=2.97 in IT aged 51-60 years. This result is extremely relevant when studying NCDs, whether isolated or concomitant, and cardiovascular risk. Among the Sustainable Development targets to be achieved by 2030 are "to reduce premature mortality from non-communicable diseases by one-third through prevention and treatment, and promote mental health and well-being". The need to know conditions and quality of life thus emerges.

Chronic respiratory diseases (CRD) ranked 3rd in the country and its regions in this study, with the exception of the South (2nd place), and with the highest frequency in PS, and the North in IT. The CRD grouped here were the non-transmissible kinds, such as asthma and chronic obstructive pulmonary disease (COPD)[20]. Infectious and neoplastic diseases were excluded. as they were rarely reported, and will not be analyzed in this article, as mentioned in the Methods section. The higher prevalence of CRD in the South is multifactorial and climate is potentially the most relevant factor since the lowest temperatures occur there half of the year. Added to this is the fact that the region has a large elderly population. Environmental specificity needs to be considered in the North, such as the forest region and its innumerable climatic peculiarities. The dismantling of Brazil's environmental policies resulted in massive fires in recent years, with effective actions having resumed in 2023.

Worldwide, CRD represents a substantial health issue as they affect more than 500 million people in middle and low-income countries. Their prevalence has progressively climbed, affecting people's quality of life with physical, emotional, and intellectual limitations, long-term disability, and an acute socioeconomic impact. Global morbidity and mortality from COPD impacts millions of people; its prevalence is growing, accompanied by a high incidence of death. The Global Alliance against Chronic Respiratory Diseases[21], created by the WHO, estimates that asthma affects 300 million people worldwide, and its prevalence in children suggests that the number of adult cases could rise in the coming years. Brazil ranks 8th, with around 20%, depending on the region and age group. An estimated 7.5 million people in Brazil have COPD arising from such preventable risk factors as smoking, air pollution, occupational exposure, and diseases, such as tuberculosis, with their potential to cause sequelae. A medical care network for people with CRD needs to be designed with an emphasis on primary care, health promotion, immunization, primary and secondary prevention, and palliative care.

Depression/anxiety was more frequently reported in the South in IT and in the Midwest in PS. A self-reported perception of "depression/anxiety", prior to the emergence of the COVID-19 pandemic, was present in 10.3% of the workers. The pre-existence of "depression/anxiety" in a predominately female population is higher among white women and progressively increases with age (especially noticeable between 51-60 years). The distribution by sex and age groups is quite similar to that found among "invisible" workers. As for skin color, although the reported frequency among Whites is slightly higher, the difference for Blacks and Browns is less than it is among higher-level professionals. The perception of anxiety/depression as a pre-existing condition does not consistently differ from the distribution found in studies on the general population. However, it should be noted that prevalence studies of the general population use anxiety and depression scales applied to subjects from selected samples, which are potentially more sensitive than self-reference to perceptions of illness under general categories. Thus, prevalence studies that use more specific measurement instruments (scales) may possibly reveal a greater prevalence. In any case, it is relevant to point out that mental suffering (under the "anxiety/depression" category) is considered a pre-existing illness among all healthcare workers. Consequently, professionals are more susceptible to symptoms of mental illness related to working conditions prior to the pandemic outbreak. It is now important to draw attention to the impact on their performance during the pandemic and how it affected the perception of mental suffering among workers in both groups. Table 5 shows how healthcare work during the pandemic affected the lives of medical

professionals and invisible workers. The data are quite revealing. A set of descriptions of intense "social suffering"[21] (a category formulated in a classic study by Kleinman *et al.*[22]) was frequently reported after the onset of the pandemic. The following stand out: changes in sleep patterns; "frequent irritability/crying"; loss of career and life satisfaction/sadness/apathy; negative feelings regarding the future/negative thinking, suicidal thoughts; difficulty concentrating or slow thinking; and an increased use of medication, alcohol, cigarettes, and energy drinks. Such symptoms had a similar effect on both groups. Reported experiences of "extreme tiredness/fatigue/discouragement", headache and generalized pain, and fear/panic were more present in the invisible workers group.

Women and men reported experiencing intense suffering, expressed as mental and somatic symptoms, many of them calling in sick and with a pessimistic view of their future. The experience of social suffering reported here cannot be understood under the usual diagnostic categories, as it corresponds to a diffuse set of signs of mortification of the body and mind, resulting from very evident social determinants, which are associated with individual susceptibility prior to the emergence of factors related to illness. The significant number of positive responses in the "loss of satisfaction in career and life/sadness/apathy; negative feeling of the future/negative, suicidal thoughts" categories points to an experience of illness that reveals the impact of work in the context of the pandemic, but then goes beyond it, suggesting that these workers have adopted a harsh, relentless image of post-pandemic mental suffering.

In conclusion, SUS played a vital and strategic role in addressing the pandemic. However, more susceptible workers became ill and died from COVID-19, exerting a strong pressure on the healthcare workforce, which regularly faced occupational risks, unprotected exposure, inefficient infection control, the scrapping of services, work overload, and pre-existing comorbidities. An apparent "paradox" was identifying that the pandemic made the invisible workers more visible, not just because they were on the front lines, but because they, too, got sick and died. The socioeconomic inequalities of the Brazilian population, especially in terms of healthcare, led to high morbidity and transmissibility.

Studies of this nature generate more interest in socially invisible occupations and can help workers gain a voice and expression in academia and the media. The authors intend to publish more papers seeking to provide a more in-depth analysis of these more than 30,000 participants by categories/occupations.

Furthermore, Brazil, a country marked by profound inequalities, also has a diverse epidemiological profile: with neglected age-old maladies, such as tuberculosis, coexisting alongside more modern syndromes, such as the metabolic, with cumulative severity. Endemics, epidemics, and pandemics are evident as scale movements. Heightened levels of depression/anxiety add vulnerability to the mix. Risk factors and NCDs interact from a biological and social point of view. The syndemic of chronic diseases, social inequality, and COVID-19 in unprotected populations triggers an explosion of morbidity and mortality. The National Health Council recommends priority measures for workers to reduce risks, ensure social/sanitary protection, and improve working conditions[23].

The challenge is to have effective responses that provide comprehensive health care and help overcome human suffering. Knowing how to manage a pandemic should be widely known as a way to preserve life, based on the principles of bioethics, beneficence, non-maleficence, autonomy, and justice.

Collaborations

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