





## Article

# Health Professionals' Safety in Facing the COVID-19 Pandemic: Perceptions from a Brazilian Municipality

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## Abstract

Health professionals' safety is directly linked to organizational culture, and during the COVID-19 pandemic, weaknesses at organizational, emotional, professional, and structural levels became evident. This study aimed to assess health professionals' perceptions of their safety in facing the COVID-19 pandemic. A cross-sectional, descriptive, and analytical study was conducted with professionals from the public health network of a Brazilian municipality who had taken medical leave due to COVID-19. Data were collected between October and December 2022 using the validated Questionnaire on Health Professional Safety in the COVID-19 Pandemic (QSP COVID-19), which consists of 30 items distributed across four domains: organizational, emotional, professional, and structural. A cut-off score  $\geq 75$  was considered a positive perception. Associations were tested using the chi-square test followed by the Bonferroni post hoc test, and multivariate logistic regression was applied to identify associated factors. Significance level: 5%. A total of 235 professionals participated, mostly women (81.7%), working in primary health care (68.1%), and employed under statutory contracts (74.5%). Only 50.6% reported an overall positive perception of safety. The emotional domain showed the highest score (85.5%), followed by the professional domain (74.0%). Organizational (50.6%) and structural (33.6%) domains had the lowest scores, reflecting shortcomings in infrastructure, human resources, and material supplies. In the multivariate analysis, temporary contracts, a 20 h workweek, and specific training were protective factors, whereas belonging to a risk group and being female increased the likelihood of negative perception in the structural dimension. Health professionals' safety is supported by continuous education, emotional support, adequate infrastructure, professional recognition, participatory leadership, and strengthening of the safety culture.

**Keywords:** working conditions; safety management; job satisfaction; health personnel; health care; COVID-19; nursing



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## 1. Introduction

The COVID-19 pandemic posed unprecedented challenges to health systems worldwide, highlighting critical gaps in the protection and safety of health professionals working

on the frontlines [1,2]. In Brazil, although the country has a universal health system and a consolidated care network with a recognized trajectory in epidemic response [3–5], the global health emergency caused by COVID-19 exposed important vulnerabilities. These weaknesses compromised not only patient safety [6,7] but also the safety of health professionals themselves [2,8–10].

Health professionals' safety is directly related to the organizational safety culture, in which each individual must share responsibility for their own protection, for patient safety, and for all those involved in care [11]. In line with this perspective, the Health Workers' Safety Charter acknowledges that "no health system can operate safely without safe health workers" [12]. Likewise, the Global Patient Safety Action Plan 2021–2030 reinforces that the safety of health workers is a prerequisite for safe care [13].

Aligned with World Health Organization (WHO) recommendations for protecting health workers during pandemics and other public health emergencies [13], the study by Lanza et al. [14] contributes by identifying dimensions underlying health professionals' safety in facing the COVID-19 pandemic: the organizational, emotional, professional, and structural dimensions.

The WHO has reiterated the importance of structured policies to protect health professionals, emphasizing continuous training and organizational strengthening [15]. Such strategies are essential to ensure the sustainability of the health workforce, even after the declaration of the end of the Public Health Emergency of International Concern and the transition of COVID-19 into an endemic condition.

In light of the need for safer, more resilient, and sustainable work environments [16]—a prerequisite for advancing the Sustainable Development Goals (SDGs), particularly SDG 3 and SDG 8 [17]. This study is justified by its search for answers to the challenges faced by health services, especially within Brazil's Unified Health System (SUS). Recognizing that, the study contributes to extracting lessons for strengthening health services in future crisis scenarios and to improve care delivery, working conditions, and the recognition of health professionals as key actors in ensuring the right to health.

Therefore, the central question is: How do health professionals perceive their safety in facing the COVID-19 pandemic? This is the first study to use the QSP COVID-19 instrument to assess such perceptions, aiming to evaluate health professionals' perceptions of their safety during the COVID-19 pandemic.

## 2. Materials and Methods

### 2.1. Study Design

This was a cross-sectional, descriptive, and analytical study, conducted in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guideline.

### 2.2. Setting, Study Period, Population, and Sample

The study was conducted at the Centro de Referência em Saúde do Trabalhador (CRESST), a Reference Center for Workers' Health in a large-sized Brazilian municipality, between October and December 2022. This municipality was selected because it is the professional base of the authors (A.C.R, S.M.F.V. and F.M.L.), which facilitated data collection. Moreover, due to the lack of external funding, conducting the research in a location where data could be collected with available resources was necessary.

The CRESST is responsible for promoting, protecting, and restoring the health of professionals linked to the municipal health network. Its main responsibilities include investigating occupational health and safety conditions among primary and medium-

complexity care professionals, as well as providing specialized care for workers affected by work-related diseases and conditions.

The eligible population comprised health professionals working in Primary Health Care (PHC) and medium-complexity services who had been granted medical leave reported to CRESST due to COVID-19 infection. The included categories were nurses, physicians, pharmacists, physiotherapists, dentists, nutritionists, psychologists, nursing technicians and assistants, laboratory technicians, radiology technicians, and community health workers (CHWs). Community health workers are part of the Family Health Strategy teams and act as a link between health services and the community. Each CHW is responsible for a territory covering up to 750 people, and their duties include health promotion, disease prevention—particularly regarding the most prevalent conditions in their assigned territory—and health surveillance, carried out through home visits and individual and collective educational activities [18].

At the time of data collection, the municipality's PHC system comprised 43 health units, which served as the preferred entry point into the SUS, offering continuous and comprehensive care to the registered population within defined territories through multiprofessional teams [18]. Medium-complexity services, such as the Polyclinic and the Specialized Mental Health Reference Service (Serviço de Referência em Saúde Mental—SERSAM), were responsible for specialized care addressing demands unresolved within PHC.

For sample size calculation, CRESST data indicated that between 1 January 2020, and 31 July 2022, a total of 690 work leaves among health professionals due to COVID-19 (International Classification of Diseases, B34.2) had been recorded, including multiple leaves for the same individual.

The calculation was based on an estimated proportion of 25.4% vaccine hesitancy against influenza among health workers, reported in a Brazilian study [19], since no local estimates of COVID-19 vaccine hesitancy specific to our target population were found in the literature. Although the reference was related to influenza, this proportion was adopted since COVID-19 is also a vaccine-preventable disease, and the value yielded the largest possible sample size in finite populations. The choice of this parameter was considered a conservative estimate, as it represents a relevant health behavior among professionals in the sector and ensures greater statistical robustness for the study. It is recognized, however, that this is an indirect parameter, whose selection aimed to maximize the statistical power, even though it does not correspond directly to the primary outcome of the present study. Thus, it should therefore be acknowledged as a methodological limitation in the interpretation of the findings.

A 95% confidence level, 5% sampling error, and 5% significance level (type I error) were considered [20]. Based on these parameters, the minimum required sample size was estimated at 221 health professionals. Health professionals were included if, after being informed about the study objectives, they agreed to participate and signed the Informed Consent Form.

### *2.3. Data Collection Procedure*

Data collection was carried out in person by a team of previously trained researchers. Eligible participants were recruited after a brief explanation of the study's objectives, risks, and benefits. Informed consent was then obtained, followed by the administration of the data collection instrument through an individual interview in a private room.

#### 2.4. Data Collection Instrument

Data were collected using the validated Questionnaire on Health Professional Safety in the COVID-19 Pandemic (QSP COVID-19) [14], in addition to a researcher-developed questionnaire for participant characterization.

The QSP COVID-19 consists of 30 items that assess professional safety across four dimensions: organizational (10 items; composite reliability = 0.979), emotional (7 items; composite reliability = 0.806), professional (5 items; composite reliability = 0.831), and structural (8 items; composite reliability = 0.889). The organizational dimension, which involves institutional support, adherence to care protocols, and professional training; the emotional dimension, linked to professional fulfillment, attitudes, emotions, and motivation at work; the professional dimension, which includes knowledge, skills, attitudes, and self-perceived safety in job performance; and the structural dimension, which refers to infrastructure, workforce availability, and provision of equipment and supplies [14]. Responses were rated on a five-point Likert scale: strongly disagree (0 points), partially disagree (25 points), neutral (50 points), partially agree (75 points), and strongly agree (100 points). The instrument scores range from 0 to 100, where 0 represents the worst perception of professional safety in facing the COVID-19 pandemic and 100 the best perception [14].

The sociodemographic and occupational variables collected in the complementary instrument for participant characterization included: age (in full years), sex (female/male), COVID-19 risk group (yes/no), work setting (primary health care/medium-complexity services), employment regime (statutory, temporary contract, other), weekly working hours (20 h, 30 h, 40 h, or other), other employment in the health sector (yes/no), worked in this unit before the COVID-19 pandemic (yes/no), length of employment in the unit (up to 6 months, 6 to 11 months, 1 to 2 years, 3 to 5 years, 6 to 9 years, 10 years or more), health professional level (technical/medium level, higher education level, other/manager), and participation in a training course for COVID-19 pandemic response (yes/no).

#### 2.5. Data Processing, Analysis, and Statistics

Data were entered into the Statistical Package for the Social Sciences (SPSS) version 20.0, using double data entry to check for duplicates, typos, and inconsistencies. Missing responses ranged from one case (Q12) to seven cases (Q1). In accordance with Brazilian ethical guidelines for research involving human participants, which guarantee the right to refuse to answer any question, these values were replaced with the “neutral” response option, as they likely reflect situations in which participants preferred not to take a position. Given that missing data accounted for only 2.7% of the total responses, this imputation strategy was applied, while acknowledging its potential to introduce bias.

Scores for the four QSP COVID-19 dimensions (organizational, emotional, professional, and structural) were calculated as the arithmetic mean of the items comprising each dimension. Overall safety perception was determined by the mean of the four dimension scores, i.e., Professional safety = (organizational domain + emotional domain + professional domain + structural domain)/4. A total score  $\geq 75$  was considered indicative of a positive perception [14].

Qualitative variables were presented as absolute and relative frequencies. Age distribution was tested with the Shapiro–Wilk test, which rejected normality, and therefore results are presented as median and quartiles. The relationship between professional safety (and its domains) and independent variables was assessed using the chi-square test with Bonferroni post hoc analysis. The Bonferroni test allowed identification of the categories with significant differences in the proportion of positive vs. negative safety perceptions. In cases where response categories were binary and expected frequencies were  $<5$  in at least

one cell, Fisher's exact test was applied. For the variable "age," the Mann–Whitney test was used.

Variables with a  $p$ -value  $< 0.20$  in the tests described above were pre-selected for the logistic regression model [21,22]. The outcome variables were health professionals' safety and the domains organizational, emotional, professional, and structural. Using the backward stepwise method, variables were progressively removed until only those with significance  $< 0.05$  remained. This procedure represents an automated strategy to optimize the model fit [22]. The significance level adopted was 5%.

As this is the first study to apply the QSP COVID-19, there was no sufficient theoretical background to define potential confounders a priori, which is acknowledged as a limitation. Multicollinearity was not explicitly tested in this study. However, given that the backward stepwise method in SPSS automatically removes redundant predictors during model selection, potential collinearity effects were indirectly addressed.

### 2.6. Ethical Considerations

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki and was approved by the Research Ethics Committee for Human Subjects of the Federal University of São João del-Rei—Centro Oeste Dona Lindu Campus, under approval number 5.703.013, dated 16 October 2022.

## 3. Results

A total of 235 health professionals participated in the study. Most were female (81.7%), worked in PHC services (68.1%), held statutory contracts (74.5%), and had a 40 h weekly workload (66.0%). Notably, 56.6% had been working at the same health unit before the pandemic, and 42.6% reported having received specific training for COVID-19 response. Regarding professional qualifications, 53.6% had a technical or secondary-level degree. Table 1 presents the sociodemographic and occupational characteristics of the participants.

**Table 1.** Characterization of the study participants.

Variables	N	%
Sex		
Female	192	81.7
Male	43	18.3
COVID-19 Risk Group		
No	169	71.9
Yes	66	28.1
Work Setting		
Primary Health Care	160	68.1
Medium-complexity services *	75	31.9
Employment Regime		
Statutory	175	74.5
Temporary contract	56	23.8
Other	4	1.7
Weekly Working Hours		
40 h	155	66.0
30 h	43	18.3
20 h	26	11.0
Others	11	4.7
Other Employment in the Health Sector		
No	191	81.3
Yes	44	18.7
Worked in this Unit before the COVID-19 Pandemic		
No	102	43.4
Yes	133	56.6

**Table 1.** *Cont.*

Variables	N	%
Length of Employment		
Up to 6 months	27	11.5
6 to 11 months	40	17.0
1 to 2 years	38	16.2
3 to 5 years	51	21.7
6 to 9 years	12	5.1
10 years or more	67	28.5
Health Professional Level		
Technical/medium level	126	53.6
Higher education	68	28.9
Other/Manager	41	17.5
Training Course for COVID-19 Pandemic Response		
No	135	57.4
Yes	100	42.6
Age-Median (Q1–Q3)	41 (36–49)	

Note: \* Includes the polyclinic, Mental Health Reference Service (SERSAM), and other medium-complexity services.

Table 2 shows the scores attributed to health professionals’ safety in facing the COVID-19 pandemic, with 50.6% of participants reporting an overall positive perception of safety. Among the four assessed dimensions, the emotional dimension had the highest proportion of positive evaluations, with 85.5% of participants scoring  $\geq 75$ , followed by the professional dimension, with 74.0% reporting positive perception. In the organizational dimension, 50.6% of respondents reported a positive perception, especially regarding items related to team support (84.7%) and encouragement to communicate safety concerns (82.9%).

**Table 2.** Description of health professionals’ safety scores in facing the COVID-19 pandemic and their respective domains (organizational, emotional, professional, and structural) and items.

Domains and Items	Minimum Score	Maximum Score	Median (Q1–Q3)	Percentage of Participants Who Assigned Scores $\geq 75$ Points (n)
Health professionals’ safety in facing the COVID-19 pandemic	11	100	75 (67–86)	50.6% (n = 119)
Organizational Dimension	0	100	75 (58–88)	50.6% (n = 119)
Q1—I have the support I need from other team members to provide care for suspected and/or confirmed cases.	0	100	100 (75–100)	84.7% (n = 199)
Q2—The qualifications of the professionals on the team are sufficient to deal with the needed actions to deal with the pandemic.	0	100	75 (50–100)	69.4% (n = 163)
Q3—I can see that the health unit I work at is continuously working to improve the team to deal with the pandemic.	0	100	75 (25–100)	55.8% (n = 131)
Q4—I notice that the professionals in my team work together as a well-coordinated team.	0	100	75 (75–100)	77.9% (n = 183)
Q5—I have the time and opportunity to discuss with team members the situations experienced in dealing with the pandemic.	0	100	75 (25–75)	59.6% (n = 140)
Q6—I am encouraged to report any concerns I may have about my safety in my day-to-day work in the face of the pandemic.	0	100	75 (75–100)	82.9% (n = 195)
Q7—The unit’s managers/coordinators/supervisors consult the team about the problems faced on a daily basis.	0	100	75 (50–100)	71.1% (n = 164)
Q8—The unit’s managers/coordinators/supervisors listen and respond to workers’ concerns.	0	100	75 (50–100)	74.5% (n = 175)
Q9—The unit’s managers/coordinators/supervisors use mistakes as learning opportunities and not as criticism.	0	100	75 (75–100)	75.4% (n = 177)
Q10—All the information needed for decision-making is routinely available to me.	0	100	75 (50–75)	66.4% (n = 156)

**Table 2.** *Cont.*

Domains and Items	Minimum Score	Maximum Score	Median (Q1–Q3)	Percentage of Participants Who Assigned Scores $\geq$ 75 Points (n)
Emotional Dimension	25	100	89 (82–96)	85.5% (n = 201)
Q11—I identify with my work.	0	100	100 (75–100)	89.4% (n = 210)
Q12—I feel that this is the right job for me.	0	100	100 (75–100)	88.5% (n = 208)
Q13—My work fulfills me professionally.	0	100	100 (75–100)	87.7% (n = 206)
Q14—I’m doing the job I’ve always wanted to do.	0	100	75 (75–100)	76.2% (n = 179)
Q15—I feel I’m doing important work.	0	100	100 (100–100)	96.1% (n = 226)
Q16—I’m proud to work in the health sector.	25	100	100 (100–100)	96.2% (n = 226)
Q17—I’ve thought about quitting my job.	0	100	0 (0–25)	77.0% (n = 181)
Professional Dimension	0	100	85 (70–95)	74.0% (n = 174)
Q18—I have sufficient knowledge to deal with the COVID-19 pandemic in the health service where I work.	0	100	75 (75–100)	83.0% (n = 195)
Q19—I have an attitude towards the COVID-19 pandemic in the health service where I work.	0	100	100 (75–100)	86.4% (n = 203)
Q20—I have sufficient skills to deal with the COVID-19 pandemic.	0	100	75 (75–100)	85.1% (n = 200)
Q21—The care I provide in the health service where I work is based on the official protocols for dealing with COVID-19.	0	100	100 (75–100)	91.5% (n = 215)
Q22—I feel safe to work in the COVID-19 pandemic.	0	100	75 (75–100)	81.3% (n = 191)
Structural Dimension	3	100	63 (47–78)	33.6% (n = 79)
Q23—I consider that the number of professionals in my health unit is sufficient to deal with COVID-19.	0	100	50 (25–100)	49.4% (n = 116)
Q24—I consider that the health unit where I work has a safe environment for dealing with COVID-19.	0	100	50 (25–75)	47.2% (n = 111)
Q25—I consider that the health unit where I work has a favorable environment in terms of infrastructure for dealing with COVID-19.	0	100	50 (0–75)	42.5% (n = 100)
Q26—I consider that the health unit provides adequate personal protective equipment for my work in the face of the pandemic.	0	100	75 (75–100)	77.9% (n = 183)
Q27—I believe that the health unit has an adequate quantity of consumables to assist people with COVID-19.	0	100	75 (50–100)	71.9% (n = 169)
Q28—I believe that the health unit has consumables of adequate quality to assist people with COVID-19.	0	100	75 (50–100)	67.2% (n = 158)
Q29—I believe that the health unit has an adequate quantity of permanent materials to assist people with COVID-19.	0	100	75 (50–75)	61.3% (n = 144)
Q30—I believe that the health unit has permanent materials of adequate quality to assist people with COVID-19.	0	100	75 (50–75)	60.9% (n = 143)

Conversely, the structural dimension received the lowest positive evaluation, with only 33.6% of participants scoring  $\geq$  75. Nevertheless, items assessing the provision of personal protective equipment (PPE) (77.9%) and the availability of sufficient consumable materials (71.9%) were positively evaluated.

Associations between safety perception scores (overall and by dimension) and sociodemographic and occupational variables are presented in Table 3.

**Table 3.** Association between health professional safety scores (total and by domains) and sociodemographic and occupational characteristics.

Variables	Health Professionals' Safety			Organizational Dimension			Emotional Dimension			Professional Dimension			Structural Dimension		
	Score ≥ 75 (n = 119)	Score ≤ 74 (n = 116)	<i>p</i> *	Score ≥ 75 (n = 122)	Score ≤ 74 (n = 113)	<i>p</i> *	Score ≥ 75 (n = 201)	Score ≤ 74 (n = 34)	<i>p</i> *	Score ≥ 75 (n = 174)	Score ≤ 74 (n = 61)	<i>p</i> *	Score ≥ 75 (n = 79)	Score ≤ 74 (n = 156)	<i>p</i> *
Sex															
Female	95 (79.8%)	97 (83.6%)	0.453	100 (82%)	92 (81.4%)	0.913	167 (83.1%)	25 (73.5%)	0.183	143 (82.2%)	49 (80.3%)	0.747	57 (72.2%)	135 (86.5%)	0.007
Male	24 (20.2%)	19 (16.4%)		22 (18%)	21 (18.6%)		34 (16.9%)	9 (26.5%)		31 (17.8%)	12 (19.7%)		22 (27.8%)	21 (13.5%)	
COVID-19 Risk Group															
No	88 (73.9%)	81 (69.8%)	0.482	90 (73.8%)	79 (69.9%)	0.511	147 (73.1%)	22 (64.7%)	0.312	125 (71.8%)	44 (72.1%)	0.965	65 (82.3%)	104 (66.7%)	0.014
Yes	31 (26.1%)	35 (30.2%)		32 (26.2%)	34 (30.1%)		54 (26.9%)	12 (35.3%)		49 (28.2%)	17 (27.9%)		14 (17.7%)	52 (33.3%)	
Employment Regime															
Statutory	76 (63.9%) **	99 (85.3%)	0.001	79 (64.8%) **	96 (85%)	0.001	147 (73.1%)	28 (82.4%)	0.354	122 (70.1%) **	53 (86.9%)	0.03	47 (59.5%) **	128 (82.1%)	0.001
Temporary	41 (34.5%) **	15 (12.9%)		41 (33.6%) **	15 (13.3%)		51 (25.4%)	5 (14.7%)		49 (28.2%) **	7 (11.5%)		30 (38%) **	26 (16.7%)	
Other	2 (1.7%)	2 (1.7%)		2 (1.6%)	2 (1.8%)		3 (1.5%)	1 (2.9%)		3 (1.7%)	1 (1.6%)		2 (2.5%)	2 (1.3%)	
Weekly Working Hours															
40 h	17 (14.3%)	9 (7.8%)	0.193	13 (10.7%)	13 (11.5%)	0.662	21 (10.4%)	5 (14.7%)	0.617	22 (12.6%)	4 (6.6%)	0.524	11 (13.9%)	15 (9.6%)	0.513
30 h	22 (18.5%)	21 (18.1%)		21 (17.2%)	22 (19.5%)		39 (19.4%)	4 (11.8%)		32 (18.4%)	11 (18%)		13 (16.5%)	30 (19.2%)	
20 h	77 (64.7%)	78 (67.2%)		84 (68.9%)	71 (62.8%)		131 (65.2%)	24 (70.6%)		113 (64.9%)	42 (68.9%)		53 (67.1%)	102 (65.4%)	
Others	3 (2.5%)	8 (6.9%)		4 (3.3%)	7 (6.2%)		10 (5%)	1 (2.9%)		7 (4%)	4 (6.6%)		2 (2.5%)	9 (5.8%)	
Other Employment in the Health Sector															
No	98 (82.4%)	93 (80.2%)	0.668	104 (85.2%)	87 (77%)	0.105	161 (80.1%)	30 (88.2%)	0.345	140 (80.5%)	51 (83.6%)	0.588	66 (83.5%)	125 (80.1%)	0.526
Yes	21 (17.6%)	23 (19.8%)		18 (14.8%)	26 (23%)		40 (19.9%)	4 (11.8%)		34 (19.5%)	10 (16.4%)		13 (16.5%)	31 (19.9%)	
Length of Employment															
Up to 6 months	17 (14.3%)	10 (8.6%)	0.466	16 (13.1%)	11 (9.7%)	0.147	25 (12.4%)	2 (5.9%)	0.700	25 (14.4%)	2 (3.3%)	0.052	13 (16.5%)	14 (9%)	0.409
6 to 11 months	23 (19.3%)	17 (14.7%)		26 (21.3%)	14 (12.4%)		32 (15.9%)	8 (23.5%)		29 (16.7%)	11 (18%)		14 (17.7%)	26 (16.7%)	
1 to 2 years	20 (16.8%)	18 (15.5%)		23 (18.9%)	15 (13.3%)		32 (15.9%)	6 (17.6%)		32 (18.4%)	6 (9.8%)		15 (19%)	23 (14.7%)	
3 to 5 years	25 (21%)	26 (22.4%)		23 (18.9%)	28 (24.8%)		45 (22.4%)	6 (17.6%)		37 (21.3%)	14 (23%)		16 (20.3%)	35 (22.4%)	
6 to 9 years	6 (5%)	6 (5.2%)		6 (4.9%)	6 (5.3%)		11 (5.5%)	1 (2.9%)		7 (4%)	5 (8.2%)		3 (3.8%)	9 (5.8%)	
10 years or more	28 (23.5%)	39 (33.6%)		28 (23%)	39 (34.5%)		56 (27.9%)	11 (32.4%)		44 (25.3%)	23 (37.7%)		18 (22.8%)	49 (31.4%)	
Worked in this Unit before the COVID-19 Pandemic															
No	63 (52.9%)	39 (33.6%)	0.003	65 (53.3%)	37 (32.7%)	0.002	85 (42.3%)	17 (50%)	0.401	85 (48.9%)	17 (27.9%)	0.004	45 (57%)	57 (36.5%)	0.003
Yes	56 (47.1%)	77 (66.4%)		57 (46.7%)	76 (67.3%)		116 (57.7%)	17 (50%)		89 (51.1%)	44 (72.1%)		34 (43%)	99 (63.5%)	

**Table 3.** *Cont.*

Variables	Health Professionals' Safety			Organizational Dimension			Emotional Dimension			Professional Dimension			Structural Dimension		
	Score ≥ 75 (n = 119)	Score ≤ 74 (n = 116)	<i>p</i> *	Score ≥ 75 (n = 122)	Score ≤ 74 (n = 113)	<i>p</i> *	Score ≥ 75 (n = 201)	Score ≤ 74 (n = 34)	<i>p</i> *	Score ≥ 75 (n = 174)	Score ≤ 74 (n = 61)	<i>p</i> *	Score ≥ 75 (n = 79)	Score ≤ 74 (n = 156)	<i>p</i> *
Work Setting															
Primary Health Care	79 (66.4%)	81 (69.8%)		87 (71.3%)	73 (64.6%)		137 (68.2%)	23 (67.6%)		120 (69%)	40 (65.6%)		51 (64.6%)	109 (69.9%)	
Medium-complexity services	40 (33.6%)	35 (30.2%)	0.572	35 (28.7%)	40 (35.4%)	0.27	64 (31.8%)	11 (32.4%)	0.953	54 (31%)	21 (34.4%)	0.625	28 (35.4%)	47 (30.1%)	0.409
Health Professional Level															
Technical/medium level	72 (60.5%)	54 (46.6%)		72 (59%)	54 (47.8%)		112 (55.7%)	14 (41.2%)		91 (52.3%)	35 (57.4%)		47 (59.5%)	79 (50.6%)	
Higher education	32 (26.9%)	36 (31%)	0.057	29 (23.8%)	39 (34.5%)	0.155	58 (28.9%)	10 (29.4%)	0.11	57 (32.8%) **	11 (18%)	0.049	19 (24.1%)	49 (31.4%)	0.403
Other/Manager	15 (12.6%)	26 (22.4%)		21 (17.2%)	20 (17.7%)		31 (15.4%)	10 (29.4%)		26 (14.9%)	15 (24.6%)		13 (16.5%)	28 (17.9%)	
Training Course for COVID-19 Pandemic Response															
No	59 (49.6%)	76 (65.5%)		67 (54.9%)	68 (60.2%)		114 (56.7%)	21 (61.8%)		89 (51.1%)	46 (75.4%)		45 (57%)	90 (57.7%)	
Yes	60 (50.4%)	40 (34.5%)	0.013	55 (45.1%)	45 (39.8%)	0.415	87 (43.3%)	13 (38.2%)	0.582	85 (48.9%)	15 (24.6%)	0.001	34 (43%)	66 (42.3%)	0.915
Age-Median (Q1–Q3)	42 (36–50)	41 (36–49)	0.636	41 (36–50)	41 (36–49)	0.719	41 (36–49)	42 (32–53)	0.907	41 (36–50)	41 (35–50)	0.793	41 (36–49)	41 (36–50)	0.726

Note: \* Chi-square test. For age, Mann–Whitney test. \*\* In these categories, there is a difference in the proportion of low and high scores.

A statistically significant association was found between employment type and overall safety score ( $p = 0.001$ ): temporary workers showed a higher prevalence of positive perception (34.5%), whereas statutory employees predominated among those reporting low safety perception (85.3%).

There was also a significant association between time working at the health unit and safety perception ( $p = 0.003$ ): professionals working in the service before the pandemic more frequently reported negative perception (66.4%), while those who joined during the pandemic were more concentrated in the positive perception group (52.9%). In addition, participation in specific COVID-19 training was associated with greater safety perception ( $p = 0.013$ ), with 50.4% of trained professionals scoring  $\geq 75$  points.

In the organizational dimension, statutory professionals predominated among those with negative perception (85.0%), whereas temporary workers were more frequent among those with positive perception (33.6%) ( $p = 0.001$ ). Furthermore, professionals who had been working before the pandemic were more prevalent in the negative perception group (67.3%), while those who joined during the pandemic were more likely to report positive perception ( $p = 0.002$ ).

In the emotional dimension, no statistically significant associations with the analyzed variables were identified. In the professional dimension, statutory professionals showed a higher prevalence of negative perception compared with temporary workers ( $p = 0.030$ ). Additionally, working at the health unit prior to the pandemic was associated with less favorable professional perception ( $p = 0.004$ ). There was also an association between educational level and perception: professionals with higher education were more frequent in the positive perception group ( $p = 0.049$ ). Participation in COVID-19 training was also associated with better professional perception ( $p = 0.001$ ).

Finally, in the structural dimension, significantly more positive perceptions were observed among male professionals ( $p = 0.007$ ), those not belonging to COVID-19 risk groups ( $p = 0.014$ ), those with temporary contracts ( $p = 0.001$ ), and those who joined the service during the pandemic ( $p = 0.003$ ).

Multivariate logistic regression models are presented in Table 4.

**Table 4.** Multivariate logistic regression models \* for health professional safety scores and the organizational, professional, and structural domains.

		Health Professionals' Safety		Organizational Dimension		Professional Dimension		Structural Dimension	
		OR (CI 95%)	<i>p</i> Value	OR (CI 95%)	<i>p</i> Value	OR (CI 95%)	<i>p</i> Value	OR (CI 95%)	<i>p</i> Value
Sex	Male							1	
	Female							2.18 (1.08–4.41)	0.03
COVID-19 Risk Group	No							1	
	Yes							2.4 (1.19–4.88)	0.015
Employment Regime	Statutory	1		1				1	
	Temporary Contract	0.22 (0.11–0.45)	<0.0001	0.31 (0.16–0.58)	<0.0001			0.33 (0.17–0.63)	0.001
	Other	0.51 (0.06–4.04)	0.52	0.82 (0.11–5.98)	0.847			0.25 (0.03–1.95)	0.185

**Table 4.** *Cont.*

	Health Professionals' Safety		Organizational Dimension		Professional Dimension		Structural Dimension	
	OR (CI 95%)	<i>p</i> Value	OR (CI 95%)	<i>p</i> Value	OR (CI 95%)	<i>p</i> Value	OR (CI 95%)	<i>p</i> Value
Weekly Working Hours								
40 h	1							
30 h	0.64 (0.31–1.33)	0.233						
20 h	0.36 (0.14–0.90)	0.029						
Others	1.97 (0.48–8.10)	0.347						
Worked in this Unit before the COVID-19 Pandemic								
Yes					1			
No					0.40 (0.21–0.76)	0.005		
Training Course for COVID-19 Pandemic Response								
Yes	1				1			
No	2.19 (1.25–3.84)	0.006			2.96 (1.52–5.76)	0.001		
Classification capacity of the model	65.5%		59.1%		74%		67.2%	

Note: OR: odds ratio. CI 95%: confidence interval of 95%. \* Multivariate logistic regression backward with stepwise method. Value “1” is the reference category.

Regarding overall health professional safety in facing the COVID-19 pandemic, professionals with temporary contracts were 78% less likely to report negative safety perception compared with statutory workers ( $p < 0.0001$ ). Weekly workload was also relevant: those working 20 h per week were 64% less likely to report low safety perception compared with those with 40 h schedules ( $p = 0.029$ ). In addition, professionals who did not participate in specific training for pandemic response were 119% more likely to report negative safety perception compared with those who had received such training.

In the organizational dimension, temporary professionals were 69% less likely to report negative perception compared with statutory workers ( $p < 0.0001$ ).

In the professional dimension, those who had not been working at the health unit before the pandemic were 60% less likely to report negative perception compared with those who had ( $p = 0.005$ ). Furthermore, not participating in training was associated with a 196% increase in the likelihood of negative professional perception.

In the structural dimension, female professionals were 118% more likely to report negative perception compared with males ( $p = 0.030$ ). Participants belonging to COVID-19 risk groups were 140% more likely to report negative perception compared with those not in risk groups ( $p = 0.015$ ). Once again, temporary workers were 67% less likely to report negative perception compared with statutory professionals ( $p = 0.001$ ).

#### 4. Discussion

This study analyzed the safety perception of 235 health professionals in facing the COVID-19 pandemic in a Brazilian municipality, highlighting overall and domain-specific scores—organizational, emotional, professional, and structural—along with the identification of associated factors. Considering a score  $\geq 75$  points as indicative of a positive perception of professional safety, as defined by Lanza et al. [14], only 50.6% of participants reported satisfactory safety perception during the pandemic.

This finding reveals significant vulnerabilities in the work environment and underscores the need for interventions to mitigate identified risks. The COVID-19 pandemic exposed and amplified longstanding structural deficiencies affecting the daily work of

SUS professionals, particularly those related to chronic underfunding, precarious public investment, and unfavorable working and contracting conditions [4].

In this context, the present results reinforce that recognizing health professionals' safety as a prerequisite for patient safety [13] should guide the strengthening of institutional policies, as well as post-pandemic quality and safety measures [16,23]. Aligned with this understanding, the Health Worker Safety Charter emphasizes that safe care cannot be delivered in health systems that do not guarantee dignified and secure conditions for their workers [12]. Therefore, protecting workers requires not only emergency responses but also continuous strengthening of organizational structures and available resources [13].

The emotional dimension was positively evaluated by 85.5% of participants, reflecting a strong professional identification with their work and feelings of achievement and pride, even in adverse contexts. These findings corroborate a Norwegian study in which frontline professionals reported a sense of purpose, pride in professional identity, adaptability, and motivation during the pandemic, despite challenging care conditions [1].

Similarly, Zhu et al. [24] and Ng et al. [25] highlighted strengthened emotional resilience, accompanied by a renewed sense of professional responsibility, particularly when work was perceived as meaningful for the well-being of patients and team members. Such attributes were crucial for maintaining care continuity and emotional well-being during the most critical moments of the health crisis [24].

Although this study indicates predominately positive evaluations across all items in the emotional domain, continuous support for physical and mental well-being, as well as professional recognition, remains necessary. This is in line with the recommendations of the Global Patient Safety Action Plan 2021–2030 [13]. These results contrast with national [8,10] and international [26–29] findings that reported feelings of undervaluation and disconnection from professional practice, often exacerbated by resource scarcity, workload, and lack of institutional support and recognition.

The professional dimension showed a positive perception in 74% of participants. Items evaluating the knowledge, attitude, and skill triad received positive responses from 83%, 86.4%, and 85.1% of participants, respectively. Similar findings were observed in studies identifying high levels of knowledge, attitudes, and practices among health professionals, often associated with specific pandemic-related training [30,31].

Given the rapid spread and initially limited clinical knowledge of COVID-19, frontline professionals required continuous access to updated information to guide care. Official bodies and health institutions played a central role as reliable information sources amid fragmented information and misinformation [32]. In our study, 91.5% of professionals positively perceived the adoption of official protocols for suspected and confirmed COVID-19 cases.

While protocols aim to standardize practices and ensure safe care, research indicates that their effectiveness depends on institutional policies promoting continuous training adapted to local realities and service needs [33]. In our study, pandemic-specific training significantly reduced the likelihood of negative perception in the professional domain, emphasizing the central role of continuing education as a protective factor. Studies also highlight the importance of understanding factors influencing professional attitudes—such as education level, experience, and service type. This knowledge supports the development of more effective, worker-sensitive educational strategies, enhancing preparedness and resilience during health emergencies [34].

In this study, the item “I feel safe performing my duties during the COVID-19 pandemic” predominated with positive perceptions. However, a study in India revealed that only 42.4% of frontline workers considered themselves prepared for donning and doffing PPE, and 65.8% were confident in providing direct patient care. Technical-level professionals were significantly less prepared than nurses and physicians [35]. In Brazil,

Costa et al. [36] found a positive association between training and proper PPE use among PHC professionals. These findings underscore the importance of continuous qualification and consistent theoretical-practical approaches to protect workers in critical contexts such as the pandemic [37].

The organizational dimension received positive evaluation from 50.6% of participants and encompasses elements such as effective communication, management practices and resources, team work organization, and adherence to care protocols [16]. During the pandemic, organizational resilience was strengthened through continuous updates on the public health emergency, team-based decision-making, coordination, and alignment across hierarchical levels [38].

A key aspect of the organizational dimension was peer support: 84.7% reported receiving necessary support from colleagues when caring for suspected or confirmed COVID-19 cases. Similar findings in other studies indicate strengthened collaboration across sectors, teams, and hierarchical levels in response to workplace challenges, enhancing both collective performance and individual confidence [39,40]. Additionally, 69.4% of professionals positively assessed team qualification to handle pandemic measures. However, only 55.8% perceived that the health unit promoted ongoing team improvement. A qualitative study highlighted significant gaps in training, particularly regarding biosafety and care for critical patients [41].

Given time constraints, workload, and pandemic restrictions, agile knowledge dissemination strategies were necessary. Social media, educational videos, apps, and remote courses were crucial for ensuring continuing professional education [42]. Regarding time and opportunities for team discussions, 59.6% responded positively. National [42,43] and international evidence [39,44] supports formal meetings, discussion circles, and digital channels as effective mechanisms for experience exchange and mutual support.

In critical contexts such as the COVID-19 pandemic, manager-team relations played a strategic role in creating safe work environments [43,45]. In this study, positive perceptions were observed regarding management-team interaction, especially active listening and using errors as learning opportunities, reflecting participatory leadership. Other studies corroborate this, noting shifts toward more collaborative and horizontal decision-making, facilitating joint strategy development and faster prioritization of emergent demands [38,46].

The structural dimension showed the lowest positive evaluation among the analyzed domains, with only 33.6% of participants scoring  $\geq 75$ . These results reinforce the need to achieve the Global Patient Safety Action Plan 2021–2030 targets, including sustained investment in human resources, physical infrastructure, and essential supplies [13]. Literature [8–10,14] and the Plan itself [13] indicate that structural deficiencies directly affect both workers' safety perception and the effectiveness of crisis responses.

Despite these limitations, two items received more favorable evaluations: PPE provision (77.9%) and availability of sufficient consumable materials (71.9%). Studies show that safety perception is closely linked to continuous and adequate access to PPE [24,47]. In the Netherlands, frontline workers reported lower emotional exhaustion and better work engagement when adequate materials were guaranteed [48].

Conversely, insufficient staffing, physical limitations, and shortages of permanent materials were negatively perceived, confirming pre-pandemic evidence [49–51] and exacerbated during the health crisis [8,10,52]. Similar issues were reported in other countries, including oxygen and medication shortages and logistical difficulties in acquiring PPE and basic hospital materials [53,54]. Negative perceptions regarding physical infrastructure and organizational environment may be explained by the abrupt need to adapt units for patient care, often with temporary or inadequate structures [55]. Poor ventilation, lack of

specific donning/doffing areas, inadequate signage, and absence of safe isolation zones compromise infection prevention and worker safety [56,57].

Space configuration and organizational planning are thus essential for ensuring safety and care quality. Primary care and outpatient services experienced high occupational exposure to COVID-19, highlighting the need for strong institutional policies, risk monitoring, and continued investment in human and material resources [58]. Only 42.1% of participants considered staffing sufficient to respond to COVID-19. Adequate personnel availability is critical for an effective crisis response, requiring both workforce expansion and technical qualification to ensure safe practice [2,59].

In the multivariate analysis, temporary workers were less likely to report low safety perception, both in the overall score and in the organizational and structural domains. This result may be related to lower exposure to chronic workload and greater adaptability to changing contexts, characteristics often attributed to temporary contracts. Similar findings were reported in the Netherlands, where temporary workers reported lower work demands and better operational functioning during the pandemic compared to permanent staff, possibly because they were assigned to organizational flows already adapted to sanitary requirements [29]. In Portugal, experiences of human resource reorganization during the health crisis also demonstrated gains in safety perception resulting from strategic redeployment and team resizing, allowing for more agile responses aligned with current protocols [45].

Another protective factor identified was a 20 h weekly work schedule, associated with a lower likelihood of negative safety perception. Reducing work hours is supported to mitigate physical and emotional fatigue, cited as one of the main occupational risk factors during the pandemic. In Brazil, studies in PHC services had already indicated that work overload directly affected professionals' safety and the quality of care [10,52]. Similar situations were observed in Asian hospitals, where workers under less operational pressure reported better safety perception, even in high-risk roles [25].

The absence of pandemic-specific training was associated with a higher probability of low safety perception, both in the overall score and in the professional domain. Training not only updates technical knowledge and protocols but also reinforces professionals' confidence in performing their duties and promotes safe practices, as recommended by the WHO [13]. In Vietnam, for example, continuous preparation and training strategies were crucial to strengthening health system resilience and workers' safety perception [59]. Therefore, developing health professionals' competencies and skills is a key element for team readiness and safe care delivery [13].

Within the professional domain, not working in the unit before the pandemic was associated with better safety perception. This finding may reflect the shorter tenure of professionals in the unit, especially after the transition period and adaptations to new health demands, unlike those who experienced the transitional phase and reorganization of care flows.

In the structural domain, women and professionals belonging to COVID-19 risk groups reported a higher likelihood of low safety perception. This suggests that individual factors, combined with structural deficiencies such as insufficient human resources, physical limitations, and irregular supply provision, differentially impact safety perception. In Brazil, infrastructure and supply shortages, especially in PHC, had already been identified as barriers to worker protection [52]. A similar scenario was observed in other middle- and low-income countries, such as India, where equipment scarcity and workload pressures increased health professionals' vulnerability [54].

This study presents some limitations to consider in interpreting the results. First, the cross-sectional design does not allow causal relationships to be established among the

analyzed variables. Additionally, the research was conducted in a single municipality, which may limit the generalizability of the findings to other geographic or institutional contexts. About the sample, it was restricted to primary and medium complexity health professionals from one municipality who had a formal medical leave due to COVID-19. By design, professionals who were not infected could not participate. This restriction limits external validity, which conclusions should be interpreted cautiously and not generalized to the broader population of health workers. We also acknowledge that the parameter used for the sample size calculation is an indirect one, based on influenza vaccine hesitancy, which was employed as a conservative proxy for behaviors related to COVID-19. Although this strategy maximized statistical robustness, it does not correspond directly to the primary outcome of the study. Finally, the temporal scope, during the pandemic, reflects perceptions that may change during other health crises.

Nonetheless, the analysis of the items and domains of health professional safety and the associated factors provides valuable insights into health system responses to abrupt changes and guides the development of more resilient services in times of normalcy [16,39].

## 5. Conclusions

This study revealed that only half of the participants perceived their safety positively during the COVID-19 pandemic, with notable differences across emotional, professional, organizational, and structural domains. Unique insights include the positive association between temporary employment, shorter tenure in the unit, and participation in COVID-19-specific training with safety perception, highlighting the role of targeted interventions.

By analyzing health professionals' perceptions in a public health emergency context, this study contributes to advancing knowledge on health professional safety—an element inseparable from patient safety. Based on the findings, it is possible to derive policy and practical recommendations that are particularly relevant to the Brazilian context: the need for continuous investment in ongoing education, strengthening emotional support, and promoting adequate working conditions, especially in high-demand contexts. In the realm of public management, there is an urgent need to ensure adequate infrastructure, safe work environments, and effective strategies for professional recognition. Measures such as adopting participatory leadership, institutionalizing care protocols, and strengthening a safety culture constitute strategic actions to ensure safer, more humane, and sustainable health systems, both in emergency situations and during periods of normalcy. Future research should explore health professionals' perceptions in the post-pandemic period, as well as interventions that effectively address organizational, emotional, professional and structural vulnerabilities in health professional safety.

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## Abbreviations

The following abbreviations are used in this manuscript:

CHW	Community Health Workers
CRESST	Occupational Health Reference Center— <i>Centro de Referência em Saúde do Trabalhador</i>
PHC	Primary Health Care
PPE	Personal Protective Equipment
QSP COVID-19	Questionnaire on Health Professional Safety in the COVID-19 Pandemic
SDG	Sustainable Development Goals
SERSAM	Specialized Mental Health Reference Service— <i>Serviço de Referência em Saúde Mental</i>
SPSS	Statistical Package for the Social Sciences
STROBE	Strengthening the Reporting of Observational Studies in Epidemiology
SUS	Brazil's Unified Health System
WHO	World Health Organization

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