

# Mental Impacts of COVID-19 on Technical Nursing Professionals Who Provided Care in the Brazilian Amazon on the First Wave



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## Abstract

The COVID-19 pandemic represented the greatest health challenges in the world and exposed technical nursing professionals to some occupational risks related to health care. The purpose was to evaluate the main occupational risks of the category of nursing technicians who provided care to suspected or confirmed cases of SARS-CoV-2 in Belém-Pará on 2021. The sample was recruited by Respondent-Driven Sampling (RDS). Exploratory analysis was performed in the Statistical software and in the Microsoft Excel 2019 spreadsheet. Pearson's Chi-squared test was applied for values below  $<5$ . Descriptive analysis, comparisons and relationships of variables were performed using the Chi-squared test. In all tests, the significance level set at  $p < 0.05$  was considered. There was a predominance of positivity in brown ethnicity, female gender, age group 40 to 49 years, higher frequency of obesity, work activity in public hospitals. In the evaluation of mental health scales by average score, SRQ, AUDIT-C, PHQ-9, GAD-7 and PCL-5, almost 70% of problems related to physics and mental health were obtained. This study showed that technical nursing professionals are exposed. Some significant occupational hazards risks were identified during their work routine. Thus, it is necessary to guarantee actions by public and private authorities for better working conditions for the category.

**Keywords:** Nursing Technician; Occupational Risks; COVID-19; Nurses; SARS-CoV-2; Mental Health

**Abbreviation:** RDS: Respondent-Driven Sampling; SRQ: Self Report Questionnaire; PHQ: Patient Health Questionnaire; AUDIT: Alcohol Use Disorders Identification Test; GAD-7: General Anxiety Disorder-7; PCL-5: Posttraumatic Stress Disorder Checklist for DSM-5; PPE: Personal Protective Equipment

## Introduction

The covid 19 virus has gained great proportions, reached all continents and exposed structural problems in health care in Brazil and the world. It highlighted the insufficiency in the number of hospital beds and supplies for health professionals who worked on the front lines of the fight against the COVID-19 pandemic [1]. In May 2020, Brazil ranked first among countries in terms of the number of deaths and contamination of healthcare professionals.

According to data from the Federal Nursing Council, more than 20 thousand healthcare professionals were laid off by June 2020 due to COVID-19, the majority of whom were nursing technicians [2].

The COVID-19 pandemic has had a significant impact on the mental health of healthcare workers, including nursing professionals, who have been at the forefront of the pandemic response, such as in regions where the Brazilian health system

was overloaded, like in locations in the Amazon region [3,4]. This study evaluated the mental impacts caused by COVID-19 in the nursing technician category who provided care to suspected or confirmed cases of SARS-CoV-2 in the metropolitan region of Belém-Pará, Northern Brazil, in 2021. This study is important because it can help identify the mental health needs of healthcare workers and inform interventions to support their mental health. The study can also contribute to the scientific literature on the mental health impacts of the COVID-19 pandemic on healthcare workers, particularly nursing professionals, who have been disproportionately affected by the pandemic.

## Material and Methods

### Study Design and Logistics

The research was conducted in accordance with the ethical precepts stipulated by the Declaration of Helsinki, and its protocol was approved by the Research Ethics Committee of FIOCRUZ campus Instituto Aggeu Magalhães (opinion number 4021099). The methodological procedures were reported in accordance with STROBE - Strengthening the Reporting of Observational Studies in Epidemiology. This study resulted from the national multicenter project that covered the states of Pernambuco, Rio Grande do Sul, Ceará, São Paulo and Pará. The institutions involved in the research were responsible for collecting data in their region of coverage by applying a questionnaire via electronic form for mobile (sent via WhatsApp Software). This is a cross-sectional study of nursing technician health professionals who provided care to suspected or confirmed cases of COVID-19 in the metropolitan region of Belém - Pará from January to December 2021 and who signed up to the research through the Term Informed Consent Form (TCLE).

### Data Collection Strategies and Inclusion Criteria

To recruit participants, first of all, the inferential part of the sample number of participants to be used for the study was confirmed through a proportion calculation of the disease on the OpenEpi Menu website ([https://www.openepi.com/Menu/OE\\_Menu.htm/](https://www.openepi.com/Menu/OE_Menu.htm/)). The study used the sampling technique known as Respondent-Driven Sampling (RDS), according to Heckathorn (1997). This sampling technique is a substitute for the snowball sampling technique, to solve the problem of sampling randomness. The RDS is widely known and used in studies on HIV/AIDS [5,6]. It differs from simple random samples, as recruitment is done from the network of acquaintances of the initially selected individuals ("called seeds"), expanding the study population through contact chains (Heckathorn, 2007) taking into account, in selection and analysis, the correlation of information between individuals.

Technical nursing professionals who joined the research were included by accepting the invitation sent by message via WhatsApp and the Informed Consent Form (TCLE) and filling out the electronic form on their cell phone. Professionals who worked providing direct care to patients with COVID-19 in the

metropolitan region of Belém, whether in public or private institutions during 2021, were included.

To ensure sample coverage, three technical nursing professionals (called seeds) were invited by the project coordinator. Each of them answered the electronic questionnaire and to continue the research, each one invited three colleagues from their professional category via WhatsApp messages and so on until the sample size of 158 nursing technicians was reached. The questionnaire was based on the WHO Guide for risk assessment of health professionals (2020). The following variables were included: Sex, Age, Workplace, Work sector, Number of places working, Use of PPE, Procedures, exposure resulting from accidents with biological material. The questionnaire was administered using an electronic form for a smartphone and managed by a digital platform developed by a team specialized in information technologies.

### Data Analysis

To assess mental/emotional impacts, five validated instruments were used: the Self Report Questionnaire (SRQ-20), which assesses mental suffering; the Alcohol Use Disorders Identification Test (AUDIT C), used to check the harmful consumption of alcoholic beverages, Patient Health Questionnaire (PHQ-9), a tool used to identify signs of depression; the General Anxiety Disorder-7 (GAD-7), responsible for checking the presence of anxiety and the Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5) which assesses the possible presence of post-traumatic stress [7,8].

Thus, a flow was created in which participants responded first to the validated instruments SQR-20 and AUDIT-C. If the score obtained in the SQR-20 was > 8 and in the AUDIT-C was > 6, they were directed to the PHQ-9 instruments, GAD-7 and PCL-5 [9-11]. The recommendation to utilize the AUDIT-C (Alcohol Use Disorders Identification Test - Consumption) and SRQ-20 (Chronic Respiratory Questionnaire) as initial screens for depression and anxiety within a multi-step process was used since their proven effectiveness in identifying individuals who require more comprehensive mental health assessments [9].

The frequency of positivity of nursing technicians participating in the study was assessed through self-reporting of positivity using the rapid test and/or RT-PCR, correlating with the variables from the WHO questionnaire and with the instruments for assessing mental/emotional impacts.

An exploratory analysis of the professional category under study was carried out using the Statistical software. Afterwards, the data was entered and coded into a spreadsheet in the Microsoft Excel 2019 program, to check for possible inconsistencies. They were analyzed with the aid of IBM SPSS Statistics v. 26.0 software (IBM Corp.®, Armonk, NY, USA). Then, Pearson's Chi-square test was applied for lower values <5. Next, a descriptive analysis of all variables was carried out and comparisons and relationships

were carried out using the Chi-square test to identify factors associated with the study outcomes. In all tests, the significance level established at  $p < 0.05$  was considered.

**Results**

A total of 158 technical nursing professionals took part in this research. Of which, 129 (81.65%) were female, with an average age for both sexes of 30 to 39 years (33.54%). 111 professionals (70.25%) had comorbidities, the most cited being obesity, 19 (12.03%). The majority had 1 to 2 employment relationships, 155 (98.10%) in public hospitals, 104 (65.82%) and in the infirmary environment (42.41%). A total of 93 (58.83%) technicians reported having had training in the use of PPE and the most used PPE were disposable props (10.13%), waterproof coats and protective glasses (8.86%) and face shields (8.23%). 72.15% of professionals participated in procedures with biological risk, with disposable props (6.96%), face shield (3.16%) and waterproof coat (3.16%) being the PPE always used. In relation to accidents with biological materials, the most cited was perforation with any contaminated instrument (5.70%) followed by the splash of biological liquid/secretions on non-intact skin (1.90%). Of the professionals interviewed, 42.42% classified the risk of contracting COVID-19 as very high and only 102 (64.56%) responded that they had carried out a test for SARS-CoV-2. These informations were included as Supplementary Material S1.

The highest percentage of both positive and negative individuals was represented by brown color, being positive (51.96%) and negative (21.57%). In the positive versus negative comparison, the results were significant ( $p$ -value=0.051). Regarding symptoms suggestive of COVID-19, 66.67% presented any symptom related to the disease, with the positive versus negative comparison being significant ( $p < 0.01$ ) (Table 1).

The age of positive individuals was 40 to 49 years, while the age of negative individuals was 30 to 49 years. When comparing positives versus negatives, there was no significance

in relation to age ( $p$ -value= 0.941). Regarding gender, there was a predominance of females, with no significant difference between positive and negative results. Of the professionals tested, 40.20% who were positive for SARS-CoV-2 received training in the use of personal protective equipment and 11.76% reported having had an accident with biological material (Table 1).

According to the SRQ psychiatric symptomatology assessment protocol, the physical and behavioral signs most cited by technical nursing professionals were: “sleeping poorly” (N=87/55.06%), “feeling nervous, tense ( a) or worried” (N=78/49.37%), “gets tired easily” (N=74/46.84%), “has been feeling sad lately” (N=70/44.30%), “ has frequent headaches” (N=65/41.14%) and “has unpleasant sensations in the stomach” (N=64/40.51%). It was described in Supplementary Material S2. For SRQ Score - 20\* 27.22% of mental suffering was obtained (Table 2).

In the test (AUDICT-C) it was possible to identify low risk in both females (63.92%) and males (9.51%) (Table 3). For the AUDIT-C Score, 6.97% of mental suffering was obtained (Table 4). Regarding the evaluation of mental health scales by average score, relating positive VS negative nursing technicians for SARS-CoV-2, for the SRQ test 67.65% of professionals were positive and showed some physical and behavioral signs compatible with psychiatric symptoms. In the AUDICT-C test, 67.65% of respondents were positive and reported problems related to substance use. Among the 158 participants who responded to this study’s questionnaire, only 102 were tested for COVID-19, and of these 102, only 33 passed to the second phase of the mental health test, which comprises the PHQ-9, GAD-7 and the PCL-5 test. Regarding the PHQ-9 Patient Health Questionnaire, 69.70% were positive and reported difficulties related to physical and mental health. On the GAD-7 Scale, 69.70% were positive and reported anxiety. In the Post-Traumatic Stress Disorder Checklist for DSM-V (PCL-5) 69.70% were positive and reported post-traumatic stress related to the COVID-19 pandemic (Table 5).

**Table 1:** Factors associated with positive SARS-CoV-2 in nursing technicians in Belém-PA (2021).

Variables	Negative (%)	Positive (%)	Total (%)	p-value
<b>Age</b>				
< 30	5 (4.90%)	9 (8.82%)	14 (13.73%)	0.941
> 60	1 (0.98%)	1 (0.98%)	2 (1.96%)	
30 - 39	11 (10.78%)	20 (19.61%)	31 (30.39%)	
40 - 49	11 (10.78%)	26 (25.49%)	37 (36.27%)	
50 - 60	5 (4.90%)	13 (12.75%)	18 (17.65%)	
<b>Race</b>				
Yellow	2 (1.96%)	0 (0.00%)	2 (1.96%)	0.051
White	3 (2.94%)	11 (10.78%)	14 (13.73%)	
Indigenous	0 (0.00%)	0 (0.00%)	0 (0.00%)	
Brown	22 (21.57%)	53 (51.96%)	75 (73.53%)	
Black	6 (5.88%)	5 (4.90%)	11 (10.78%)	

Sex				
Female	29 (28.43%)	55 (53.92%)	84 (82.35%)	0.311
Male	4 (3.92%)	14 (13.73%)	18 (17.65%)	
Comorbidities				
Diabetes	2 (1.96%)	3 (2.94%)	5 (4.90%)	0.708
Hypertension	4 (3.92%)	8 (7.84%)	12 (11.76%)	0.938
Obesity	6 (5.88%)	12 (11.76%)	18 (17.65%)	0.921
Heart diseases	1 (0.98%)	3 (2.94%)	4 (3.92%)	0.748
Kidney disease	1 (0.98%)	0 (0.00%)	1 (0.98%)	0.146
Other illness	6 (5.88%)	7 (6.86%)	13 (12.75%)	0.255
No illness	20 (19.61%)	45 (44.12%)	65 (63.73%)	0.65
Work places				
UBS	12 (11.76%)	24 (23.53%)	36 (35.29%)	0.876
UPA	1 (0.98%)	3 (2.94%)	4 (3.92%)	0.748
Public hospital	21 (20.59%)	47 (46.08%)	68 (66.67%)	0.653
SAMU	0 (0.00%)	3 (2.94%)	3 (2.94%)	0.224
Private hospital	3 (2.94%)	10 (9.80%)	13 (12.75%)	0.444
Office/home	1 (0.98%)	4 (3.92%)	5 (4.90%)	0.545
Stopped using PPE				
Disposable gloves	4 (3.92%)	5 (4.90%)	9 (8.82%)	0.417
N95 Mask	14 (13.73%)	26 (25.49%)	40 (39.22%)	0.646
Surgical mask	4 (3.92%)	6 (5.88%)	10 (9.80%)	0.586
Face shield	16 (15.69%)	21 (20.59%)	37 (36.27%)	0.076
Protective goggles	12 (11.76%)	17 (16.67%)	29 (28.43%)	0.219
Disposable surgical gown	10 (9.80%)	16 (15.69%)	26 (25.49%)	0.441
Waterproof coat	15 (14.71%)	24 (23.53%)	39 (38.24%)	0.299
Disposable hat or cap	4 (3.92%)	6 (5.88%)	10 (9.80%)	0.586
Disposable props	10 (9.80%)	20 (19.61%)	30 (29.41%)	0.891
Had training in the use of PPE	17 (16.67%)	41 (40.20%)	58 (56.86%)	0.451
Accident with biological material	3 (2.94%)	12 (11.76%)	15 (14.71%)	0.268
Symptoms suggestive of COVID-19	21 (20.59%)	68 (66.67%)	89 (87.25%)	<0.001

**Table 2:** SRQ Score - 20\* in nursing technicians who treated cases of COVID-19, with the cutoff point for moving to the second phase > 8, in Belém, PA, 2021.

Score	N	%	Mental suffering
0	23	14.56%	
1	10	6.33%	
2	19	12.03%	
3	16	10.13%	
4	10	6.33%	
5	13	8.23%	
6	9	5.70%	
7	5	3.16%	

8	10	6.33%	
9	4	2.53%	Yes
(cutoff)			
10	6	3.80%	Yes
11	9	5.70%	Yes
12	13	8.23%	Yes
13	2	1.27%	Yes
14	2	1.27%	Yes
15	1	0.63%	Yes
16	4	2.53%	Yes
17	1	0.63%	Yes
18	1	0.63%	Yes
Grand total	158	100.00%	
Total in the next phase	43	27.22%	

**Table 3:** Alcohol Use Disorders Identification Test - AUDIT C Scores and risk categories for alcohol use in nursing technicians who cared for COVID-19 in Belém, PA, 2021.

Score	Female	%	Male	%	n total	%
0	83	52.53%	9	5.70%	92	58.23%
1	8	5.06%	2	1.27%	10	6.33%
2	10	6.33%	2	1.27%	12	7.59%
3	5	3.16%	2	1.27%	7	4.43%
4	6	3.80%	5	3.16%	11	6.96%
5	5	3.16%	3	1.90%	8	5.06%
6	6	3.80%	1	0.63%	7	4.43%
7	4	2.53%	2	1.27%	6	3.80%
8	1	0.63%	2	1.27%	3	1.90%
9	1	0.63%	1	0.63%	2	1.27%
Grand total	129	81.65%	29	18.35%	158	100.00%
<b>Risk categories</b>						
	Female	%	Male	%		
Low risk	101	63.92%	15	9.51%		
Moderate risk	16	10.12%	8	5.06%		
High risk	10	6.33%	3	1.90%		
Severe risk	2	1.26%	3	1.90%		

**Table 4:** AUDIT-C score in nursing technicians who treated cases of COVID-19, with the cutoff point for moving to the second phase > 6, in Belém, PA, 2021.

Score	N	%	Mental suffering
0	92	58.23%	
1	10	6.33%	
2	12	7.59%	
3	7	4.43%	
4	11	6.96%	

5	8	5.06%	
6	7	4.43%	
7	6	3.80%	Yes
(cutoff)			
8	3	1.90%	Yes
9	2	1.27%	Yes
Grand total	158	100.00%	
Total in the next phase	11	6.96%	

**Table 5:** Assessment of mental health scales by average score, of professionals who were tested for COVID-19, positive VS negative for SARS-CoV-2 in nursing technicians, Belém-PA 2021.

Mental health	n	Positive	%	Negative	%
SRQ	102	69	67.65%	33	32.35%
Average score		6.01		5.55	
AUDIT-C	102	69	67.65%	33	32.35%
Average score		1.84		1.42	
PHQ-9	33	23	69.70%	10	30.30%
Average score		7.48		9.2	
GAD-7	33	23	69.70%	10	30.30%
Average score		5.96		7.6	
PCL-5	33	23	69.70%	10	30.30%
Average score		21.52		20	

The AUDIT-C score is made on a scale of 0 to 12 points. Each question on the instrument has five answer options, allowing a score of 0 to 4 for each: a = 0 points, b = 1 points, c = 2 points, d = 3 points, e = 4 points. For men, a score of 0 to 3 is considered low risk; between 4 and 5 points, moderate risk; between 6 and 7 points, high risk and 8 to 12 points, severe risk. For women, a score of 0 to 2 is considered low risk; between 3 and 5 points, moderate risk; between 6 and 7 points, high risk and between 8 and 12 points, severe risk.

Among the 158 participants, only 102 took the test for COVID-19, and of these 102, only 33 passed to the second phase of the mental health test considering the cutoff score > 8 of the SQR test and/or > 6 of the AUDIT-C.

### Discussion

Health professionals who work in low, medium and high complexity networks providing care for suspected or confirmed cases of COVID-19 are susceptible to infection by the SARS-CoV-2 virus due to the nature of their work activity. Studies during the pandemic revealed that all countries had a large number of infected professionals and high mortality rates. In Brazil, until August 2021, the professional category most affected by COVID-19 contamination were nursing professionals, highlighting the large percentage for the number of deaths. In a literature review

investigating the characteristics of healthcare professionals affected by COVID-19, it was identified that in China, Italy and the USA there was a predominance of females and an age group over 40 years old in up to 70% of related research [12].

The data from this study regarding gender also detected a higher frequency for females. These data can be justified because the nursing profession is historically composed mostly of female professionals, whether they are nurses or nursing technicians. Thus, the profile of the professionals who participated in this research corroborates the study by Hernandez ESC, et al. (2017), where, according to him, Brazilian health professionals are, for the most part, made up of women, young people, over 30 years old [13]. However, in the present study there was no statistical difference between genders in relation to positivity for SARS-CoV-2.

Thus, corroborating the global index and the state of Pará, this study revealed that 66.67% of technical nursing professionals were positive in a test for SARS-CoV-2 and had symptoms of COVID-19. This high positivity rate may be related to the work process of the technical nursing professional who needed to deal with immediate care for patients with COVID-19, requiring high productivity in performing tasks, in the shortest possible period. The high number of symptomatic professionals who did not take any test for SARS-CoV-2 (69 out of 158) is notable. In the study

questionnaire there was no question about the reason, however on April 23, 2020, nursing technicians and nurses in Rio de Janeiro reported the lack of availability of tests for professionals suspected of having COVID-19. Even on April 28, 2020, the hospital cleaner (68 years old) had the right, but was unable to take the test for COVID-19 [14].

In April 2020, the Ministry of Health (MS) issued a document on the distribution and offer of rapid tests for COVID-19 to states and municipalities, as well as criteria established to contemplate their use, with priority given to health professionals, security professionals public and population considered a risk group [15-17]. For the equitable distribution of tests to states and municipalities, an estimate of the professional number of health workers across the entire care network was made based on data available in the Information Technology Department of the Unified Health System [18]. Although the document from the Ministry of Health (MS) (BRASIL, 2020) elucidates the planning for offering COVID-19 tests to health professionals, many reports reported difficulties in accessing them and, consequently, not carrying them out [19].

In the work context of technical nursing professionals, there was an increase in work overload, and even without knowing the disease for sure, they began to face a high demand of patients in the health service and with an insufficient number of human resources and infrastructure. inadequate in health services [20].

Work overload, stress, general imbalance and inability to deal with everyday difficulties are factors, symptoms and causes that lead to mental illness with mental and consequently behavioral disorders. Mental disorders are visibly understood as deterioration in functioning, in the sense of not being able to progress or develop daily life activities. It is also perceived by changes in psychic functions, which affect mood and emotions and are understood as something pathological. Sadness can only be characterized as a change at an unhealthy level if diagnosed as pathological sadness [21].

In this present study, the main physical and behavioral signs reported by nursing technicians were: sleeping poorly, feeling nervous, tense or worried, easily tired, feeling sad, frequent headaches, and unpleasant sensations in the stomach. Diseases such as COVID-19 can cause considerable mental stress to healthcare professionals who provide care to people affected by various pathologies, and this process can result in a decrease in decision-making capacity, the quality of interaction with patients, and increased levels of anxiety and post-traumatic stress disorders [22].

Regarding the problem related to alcohol use, it was possible to identify that both females and males presented low risk. For males, the percentages were low, which may be directly related to the size of the male sample in the study. Technical nursing professionals reported difficulties related to physical and mental

health, anxiety and post-traumatic stress related to the COVID-19 pandemic [23]. Studies have reported several impacts on the lives of healthcare workers due to the COVID-19 pandemic. A study in China, in the initial phase of the disease, showed that the pandemic seriously worsened stress and anxiety among nursing professionals, this being the category that most demonstrated some level of physical or mental exhaustion [24]. A Brazilian study reported a predominance of professionals affected by anxiety, followed by depression [25] and other studies reported feelings such as fear, uncertainty, insecurity, nervousness, anxiety, insomnia and post-traumatic stress disorder [26,27].

Thus, despite all the physical and behavioral signs reported in the aforementioned studies, the Federal Nursing Council (COFEN) prohibited associates from denying nursing care in urgent, emergency, epidemic, disaster and catastrophe situations, causing professionals to continue assisting the victims of the pandemic [28]. The study under analysis showed that the technical nursing professionals positive for COVID-19 were mostly of mixed ethnicity. However, it is expected since the Brazilian racial composition differs between regions, with a greater concentration of whites in the south and southeast regions, with black and brown races prevailing in the north and northeast regions [29].

In the present study, of the nursing technicians who were positive for SARS-CoV-2 and who reported having some comorbidity, they most frequently cited obesity. However, in the analysis for each type of comorbidity there was no significance, which may be associated with the limited size of the study population. Comorbidities in this study were more significant than in other studies. In the study by Guan WJ, et al., only 25.1% had some comorbidity, with a prevalence of hypertension followed by heart disease and diabetes [30]. Similar values were found by Huang C, et al. [31].

In the province of Muscat (Oman), the main risk factors associated with healthcare professionals infected with COVID-19 were obesity, diabetes, heart disease, chronic neurological and hematological disease, asthma and chronic lung disease [32]. In a study that evaluated healthcare professionals positive for SARS-CoV-2 in Brazil, it was shown that the main pre-existing diseases were systemic arterial hypertension, asthma/bronchitis, heart disease, diabetes, rhinitis, hyperthyroidism, obesity and multiple sclerosis [33].

According to data from this study related to the frequency of use of PPE, disposable props were the most cited as always and most often used, followed by waterproof coats, protective glasses and face shields. The disposable surgical gown was the personal protective equipment (PPE) never used, followed by the N95 mask and face shield. However, it was observed that many PPE were not used, including the cheapest and most easily accessible PPE, as 16.46% of professionals responded that they did not use disposable gloves and a surgical mask. A study reported that the

shortage of PPE contributes to intensifying professionals' fear of exposure to the coronavirus at work, contributing to psychological suffering or other illnesses. Therefore, a stable and adequate supply of PPE is extremely necessary, even in non-pandemic periods [34].

In addition to the Institutions having the obligation to provide adequate PPE, it is extremely necessary to provide clear guidance on use, creating and promoting logistical support in the supply of PPE and medical equipment, adjusting routines and educating employees, prioritizing donning and doffing of the equipment. Of the technical nursing professionals who participated in our survey, only 58.86% responded that they had been trained in the use of PPE. This percentage was much lower than expected. In another study similar to ours, also in the State of Pará, Brazil, around 72% of professionals reported receiving this training [35]. However, this study used information only from professionals from a single Health Hospital, while ours, by using the RDS methodology, several professionals from UBS, UPA, public Hospital, SAMU and private Hospital responded to the questionnaire.

In India, a study carried out with 143 frontline healthcare professionals found that only 44.1% of the total had undergone prior training in handling PPE, which is more similar to our results [36]. In this study, analyzing the results of tests for SARS-CoV-2 in relation to the use of PPE, there was no statistical significance. Biological risk is intensively encountered in the hospital environment and the need for protection against it is defined by the source of the material, the nature of the operation or experiment to be carried out, as well as the conditions under which it is carried out. In this research, 86.08% of participants reported having suffered an accident with biological material, however the frequency of individuals positive in a test for COVID-19 reporting a biological accident was higher than those negative, but without statistical significance.

A survey carried out with nursing professionals on the front line in emergency units, the majority cited that they were exposed to biological risks through contact with blood and bodily fluids, as there was a lack and shortage of various PPE, with gloves and masks being the most used, and protective glasses the least used. It was mentioned that there was a lack of adherence to safety protocols due to discomfort when using the equipment, as well as a lack of training on how to use it [37].

The greatest positivity among the professionals in this study and the lack of use of PPE questioned was in relation to the lack of use of the N95 mask, waterproof coat and face shield. However, in the analysis of the variables, no statistically significant difference was found. This lack of use of PPE may be related to the number of care provided to victims of the pandemic, which as a result has seen a significant increase in the amount of PPE needed to provide

care to them. Additionally, to optimize the use of PPE, institutional protocols were created, sometimes without scientific evidence or support from international organizations, such as the reuse of N95 masks, a condition that did not value worker health, but rather cost reduction, placing worker health at risk [38].

Nursing technicians represent the class of health professionals who have the greatest proximity to patients, which can make them more mobilized with emotional and physical issues that emerge from this professional contact and it is also necessary to consider the socioeconomic vulnerabilities of nursing technicians, being a group with lower income compared to other professionals. Thus, this study showed the reality reported by these professionals in 2021 in Belém, emphasizing agreement with other literature that portrays the precarious scenario of these professionals during the first years of the pandemic. In this study it can be observed that technical nursing professionals are exposed to numerous occupational risks, pre-existing health conditions and unavailability of supplies for greater protection during their work activities.

The main limitation of this study was the low adherence of health professionals, due to excessive work in extreme conditions. In view of this and our results, it is necessary to expand knowledge about discussions and improvement and prevention programs regarding occupational risks, strengthen worker health surveillance actions and guarantee municipal, state and federal actions for better working conditions. work for the category.

### Conclusions

Through the analysis of the variables in this study, it was possible to identify that the factors associated with positive SARS-CoV-2 in technical nursing professionals (PTEs) in Belém-PA, 2021 were race (brown color) and symptoms suggestive of COVID-19. It is also possible to observe the predominance of females and the age range of 40 to 49 years of positive individuals.

PTEs positive for SARS-CoV-2 cited the comorbidity of obesity and public hospitals as the workplace as the most common, with the N95 mask being the least used personal protective equipment. The greatest positivity for SARS-CoV-2 among the professionals in this study and the lack of use of PPE questioned was in relation to the lack of use of the N95 mask.

The physical and behavioral signs most cited by professionals were: "sleeping poorly", "feeling nervous, tense or worried". In relation to alcohol use, it was possible to identify that both genders presented low risk and the majority presented some physical and behavioral signs compatible with psychiatric symptoms. Overall, this study can help improve the mental health of healthcare workers and by ensuring that they are better equipped to provide care during the ongoing pandemic. Thus, it is necessary



to guarantee actions by public and private authorities for better working conditions for the category considering these biosecurity aspects.

**Conflict of Interest**

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be

construed as a potential conflict of interest.

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**Supplementary Material S1**

**Table 1:** Characteristics of the technical nursing professionals in the study.

Participant characteristics	Nursing technicians (n = 158)	
	n	%
<b>Sex</b>		
Female	129	81.65%
Male	29	18.35%
<b>Age</b>		
<30	26	16.46%
> 60	3	1.90%
30 - 39	53	33.54%
40 - 49	50	31.65%
50 - 60	26	16.46%
<b>Presence of comorbidity</b>		
Yes	111	70.25%
No	47	29.75%
<b>Type of comorbidity</b>		
Diabetes	6	3.80%
HAS	14	8.86%
Obesity	19	12.03%
Heart diseases	4	2.53%
Kidney disease	2	1.27%
Other Disease	19	12.03%
<b>Number of jobs</b>		
2-Jan	155	98.10%
4-Mar	3	1.90%
<b>Provider institution</b>		
Basic Health Unit (PSF)	42	26.58%
UPA	11	6.96%
Public hospital	104	65.82%
SAMU	3	1.90%
Private Hospital	26	16.46%
Office/Home assistance	8	5.06%
<b>Desktop</b>		
Emergency	32	20.25%
ICU	30	18.99%

Outpatient	28	17.72%
Nursery	67	42.41%
Others	47	29.75%

**Table 2:** Adherence to infection prevention and control during care interactions with patients with COVID-19 and accidents with biological materials.

Participant characteristics	Nursing technicians (n = 158)	
	n	%
<b>Did you have training in the use of PPE at any point during the pandemic?</b>		
No	65	41.14%
Yes	93	58.86%
<b>While providing care to a patient with COVID-19. Indicate the frequency of use of each PPE:</b>		
<b>Disposable gloves</b>		
Always (> 95%)	1	0.63%
Most of the time (greater than or equal to 50%)	2	1.27%
Sometimes (< 50%)	7	4.43%
Never	26	16.46%
Not available in the service	114	72.15%
No value stated	8	5.06%
<b>N95 Mask</b>		
Always (> 95%)	5	3.16%
Most of the time (greater than or equal to 50%)	5	3.16%
Sometimes (< 50%)	26	16.46%
Never	33	20.89%
Not available in the service	81	51.27%
No value stated	8	5.06%
<b>Surgical mask</b>		
Always (> 95%)	3	1.90%
Most of the time (greater than or equal to 50%)	11	6.96%
Sometimes (< 50%)	32	20.25%
Never	26	16.46%
Not available in the service	78	49.37%
No value stated	8	5.06%
<b>Face shield</b>		
Always (> 95%)	13	8.23%
Most of the time (greater than or equal to 50%)	15	9.49%
Sometimes (< 50%)	62	39.24%
Never	32	20.25%
Not available in the service	27	17.09%
No value stated	9	5.70%
<b>Protective goggles</b>		
Always (> 95%)	14	8.86%
Most of the time (greater than or equal to 50%)	21	13.29%

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Sometimes (< 50%)	54	34.18%
Never	25	15.82%
Not available in the service	35	22.15%
No value stated	9	5.70%
<b>Disposable surgical gown</b>		
Always (> 95%)	3	1.90%
Most of the time (greater than or equal to 50%)	5	3.16%
Sometimes (< 50%)	40	25.32%
Never	35	22.15%
Not available in the service	66	41.77%
No value stated	9	5.70%
<b>Waterproof coat</b>		
Always (> 95%)	15	9.49%
Most of the time (greater than or equal to 50%)	21	13.29%
Sometimes (< 50%)	54	34.18%
Never	26	16.46%
Not available in the service	33	20.89%
No value stated	9	5.70%
<b>Disposable hat or cap</b>		
Always (> 95%)	1	0.63%
Most of the time (greater than or equal to 50%)	0	0%
Sometimes (< 50%)	9	5.70%
Never	19	12.03%
Not available in the service	120	75.95%
No value stated	9	5.70%
<b>Disposable props</b>		
Always (> 95%)	16	10.13%
Most of the time (greater than or equal to 50%)	30	18.99%
Sometimes (< 50%)	49	31.01%
Never	16	10.13%
Not available in the service	38	24.05%
No value stated	9	5.70%
<b>Have you performed or witnessed any of the procedures: Intubation, Nebulization, Aspiration, Biological sample collection, Tracheostomy, Bronchoscopy, Resuscitation (CPR)?</b>		
No	44	27.85%
Yes	114	72.15%
<b>During these procedures, indicate how often you used PPE:</b>		
<b>Disposable gloves</b>		
Always (> 95%)	0	0%
Most of the time (greater than or equal to 50%)	0	0%
Sometimes (< 50%)	5	3.16%
Never	6	3.80%
Not available in the service	103	65.19%

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No value stated	44	27.85%
<b>N95 Mask</b>		
Always (> 95%)	2	1.27%
Most of the time (greater than or equal to 50%)	1	0.63%
Sometimes (< 50%)	12	7.59%
Never	15	9.49%
Not available in the service	84	53.16%
No value stated	44	27.85%
<b>Surgical mask</b>		
Always (> 95%)	1	0.63%
Most of the time (greater than or equal to 50%)	17	10.76%
Sometimes (< 50%)	19	12.03%
Never	16	10.13%
Not available in the service	61	38.61%
No value stated	44	27.85%
<b>Face shield</b>		
Always (> 95%)	5	3.16%
Most of the time (greater than or equal to 50%)	13	8.23%
Sometimes (< 50%)	34	21.52%
Never	23	14.56%
Not available in the service	39	24.68%
No value stated	44	27.85%
<b>Protective goggles</b>		
Always (> 95%)	4	2.53%
Most of the time (greater than or equal to 50%)	13	8.23%
Sometimes (< 50%)	33	20.89%
Never	21	13.29%
Not available in the service	43	27.22%
No value stated	44	27.85%
<b>Disposable surgical gown</b>		
Always (> 95%)	0	0%
Most of the time (greater than or equal to 50%)	4	2.53%
Sometimes (< 50%)	22	13.92%
Never	27	17.09%
Not available in the service	61	38.61%
No value stated	44	27.85%
<b>Waterproof coat</b>		
Always (> 95%)	5	3.16%
Most of the time (greater than or equal to 50%)	13	8.23%
Sometimes (< 50%)	36	22.78%
Never	28	17.72%
Not available in the service	32	20.25%
No value stated	44	27.85%

<b>Disposable hat or cap</b>		
Always (> 95%)	0	0%
Most of the time (greater than or equal to 50%)	0	0%
Sometimes (< 50%)	5	3.16%
Never	12	7.59%
Not available in the service	97	61.39%
No value stated	44	27.85%
<b>Disposable props</b>		
Always (> 95%)	11	6.96%
Most of the time (greater than or equal to 50%)	24	15.19%
Sometimes (< 50%)	29	18.35%
Never	17	10.76%
Not available in the service	33	20.89%
No value stated	44	27.85%
<b>Have you had an accident with biological material?</b>		
I didn't have an accident with biological material	136	86.08%
Other	2	1.27%
Drilling with any contaminated instrument	9	5.70%
Piercing with any contaminated instrument, Splash of biological fluid/secretions on non-intact skin, other	1	0.63%
Splash of biological liquid/secretions on the mucous membrane of the mouth/nose	1	0.63%
Splash of biological liquid/secretions on the mucous membrane of the eyes	2	1.27%
Splash of biological liquid/secretions on the mucosa of the eyes, Splash of biological liquid/secretions on the mucosa of the mouth/nose, Splash of biological liquid/secretions on non-intact skin, Piercing with any contaminated instrument	1	0.63%
Splash of biological liquid/secretions on the mucous membrane of the eyes, Splash of biological liquid/secretions on non-intact skin	2	1.27%
Splash of biological fluid/secretions on non-intact skin	3	1.90%
Splash of biological fluid/secretions on non-intact skin, other	1	0.63%
<b>How do you characterize the risk of being infected by COVID-19?</b>		
Very high risk	67	42.41%
High risk	59	37.34%
Medium risk	24	15.19%
Low risk	8	5.06%
No risk	0	0%
<b>Have you been tested for COVID-19?</b>		
No	56	35.44%
Yes	102	64.56%

Supplementary Material S2

Table 1: SRQ-20: Percentage and sample number (n) of each response applied to nursing technicians in Belém-PA, 2021.

Dimensions	n	%
Do you have frequent headaches?	65	41.14%
Do you have a lack of appetite?	14	8.86%
Do you sleep poorly?	87	55.06%
Are you easily scared?	55	34.81%
Do you have hand tremors?	26	16.46%
Do you feel nervous, tense or worried?	78	49.37%
Do you have poor digestion?	58	36.71%
Do you have trouble thinking clearly?	42	26.58%
Have you been feeling sad lately?	70	44.30%
Have you been crying more than usual?	42	26.58%
Do you find it difficult to carry out your daily activities satisfactorily?	49	31.01%
Do you have difficulty making decisions?	38	24.05%
Do you have difficulties at work (your work is painful, causes suffering)?	24	15.19%
Are you unable to play a useful role in your life?	6	3.80%
Have you lost interest in things?	29	18.35%
Do you feel like a useless, uselessly person?	5	3.16%
Have you had ideas about ending your life?	5	3.16%
Do you feel tired all the time?	58	36.71%
Do you have unpleasant sensations in your stomach?	64	40.51%
Do you get tired easily?	74	46.84%

References

1. Brito SBP, Braga IO, Cunha CC, Palácio MAV, Takenami I (2020) COVID-19 pandemic: The biggest challenge for the 21<sup>st</sup> century. *Revista Visa em Debate* 8(2): 54-63.
2. Brito VP de, Carrijo AMM, Freire NP, Nascimento VF do, Oliveira SV de (2021) Aspectos epidemiológicos da covid-19 sobre a enfermagem: Uma análise retrospectiva. *Población y Salud en Mesoamérica* 19(1): 94-119.
3. Lima KJV, de Lacerda MVG, Monteiro WF, Ferreira DS, de Andrade LLC, et al. (2023) Repercussions and Legacy of the COVID-19 Pandemic in Manaus, Brazil: The Health Managers' Perspective. *Qual Health Res* 33(8-9): 790-800.
4. Oliveira KKD de, Freitas RJM de, Araújo JL de, Gomes JGN (2020) Nursing Now and the role of nursing in the context of pandemic and current work. *Revista gaucha de enfermagem* 42: e20200120.
5. Heckathorn DD, Semaan S, Broadhead RS, Hughes JJ (2002) Extensions of respondent-driven sampling: A new approach to the study of injection drug users aged 18–25. *AIDS Behav* 6: 55-67.
6. Leite BO, Magno L, Soares F, MacCarthy S, Brignol S, et al. (2022) HIV prevalence among transgender women in Northeast Brazil - Findings from two Respondent Driven Sampling studies. *BMC Public Health* 22(1): 2120.
7. Barreto do Carmo MB, Santos LM, dos Feitosa CA, Fiaccone RL, Silva NB da, et al. (2017) Screening for common mental disorders using the SRQ-20 in Brazil: What are the alternative strategies for analysis-is? *Brazil J Psychiatr* 40(2): 115-122.
8. Du Preez EJ, Graham KS, Gan TY, Moses B, Ball C, et al. (2017) Depression, anxiety, and alcohol use in elite rugby league players over a competitive season. *Clin J Sport Med* 27(6): 530-535.
9. Boysan M, Guzel Ozdemir P, Ozdemir O, Selvi Y, Yilmaz E, et al. (2017) Psychometric properties of the Turkish version of the PTSD Checklist for Diagnostic and Statistical Manual of Mental Disorders, (PCL-5). *Psychiatry and Clinical Psychopharmacology*, 27(3): 300-310.
10. Esser P, Hartung TJ, Friedrich M, Johansen C, Wittchen HU, et al. (2018) The Generalized Anxiety Disorder Screener (GAD-7) and the anxiety module of the Hospital and Depression Scale (HADS-A) as screening tools for generalized anxiety disorder among cancer patients. *Psychoncology* 27(6): 1509-1516.
11. Kroenke K, Spitzer RL, Williams JBW (2001) The PHQ-9. *J General Internal Med* 16(9): 606-613.
12. Remuzzi A, Remuzzi G (2020) COVID-19 and Italy: What next? *The lancet* 395(10231): 1225-1228.
13. González-Timoneda A, Hernández VH, Moya SP, Blazquez RA (2021) Experiences and attitudes of midwives during the birth of a pregnant woman with COVID-19 infection: A qualitative study. *Women and birth* 34(5): 465-472.
14. Fernandes FS, Toniasso S de CC, Leitune JCB, Brum MCB, Leotti VB, et al. (2021) COVID-19 among healthcare workers in a Southern Brazilian Hospital and evaluation of a diagnostic strategy based on the RT-PCR test and retest for SARS-CoV-2. *European review for medical and*

- pharmacological sciences. Rome 25(8): 3365-3374.
15. Bastos LS, Ranzani OT, Souza TML, Hamacher S, Bozza FA (2021) COVID-19 hospital admissions: Brazil's first and second waves compared. *Lancet Respirat Med* 9(8): e82-e83.
  16. Bermudi PMM, Lorenz C, Aguiar BS de, Failla MA, Barrozo LV, et al. (2021) Spatiotemporal ecological study of COVID-19 mortality in the city of São Paulo, Brazil: Shifting of the high mortality risk from areas with the best to those with the worst socio-economic conditions. *Travel Med Infect Dis* 39: 101945-101945.
  17. Rovito R, Augello M, Ben-Haim A, Bono V, d'Arminio MA, et al. (2022) Hallmarks of Severe COVID-19 Pathogenesis: A Pas de Deux Between Viral and Host Factors. *Front Immunol* 13: 912336.
  18. Brasil. Ministério da Saúde (2022) Banco de dados do Sistema Único de Saúde-DATASUS.
  19. Barberia LG, Boing A, Gusmão J, Miyajima F, Abud A, et al. (2023) An assessment of the public health surveillance strategy based on molecular testing during three major pandemic waves of COVID-19 in Brazil. *PLOS Global Public Health* 3(8): e0002164.
  20. Al Youha S, Alowaisi O, Ibrahim IK, Alghounaim M, Abu-Sheasha GA, et al. (2021) Factors associated with SARS-CoV-2 infection amongst healthcare workers in a COVID-19 designated hospital. *J Infection and Public Health* 14(9): 1226-1232.
  21. Cai Z, Cui Q, Liu Z, Li J, Gong X, et al. (2020) Nurses endured high risks of psychological problems under the epidemic of COVID-19 in a longitudinal study in Wuhan China. *J Psychiatr Res* 131: 132-137.
  22. Leng M, Wei L, Shi X, Cao G, Wei Y, et al. (2021) Mental distress and influencing factors in nurses caring for patients with COVID-19. *NursCritical Care* 26(2): 94-101.
  23. Cedrone F, Buomprisco G, Nicola M, La Torre G, Nieto H, et al. (2022) Alcohol Use during COVID-19 Pandemic: A Cross-Sectional Survey among Healthcare and Office Workers in Italy. *Int J Environ Res Public Health* 19(19): 12587.
  24. Wang YX, Guo HT, Du XW, Song W, Lu C, et al. (2020) Factors associated with post-traumatic stress disorder of nurses exposed to corona virus disease 2019 in China. *Med* 99(26): e20965.
  25. Han Y, Zhao W, Pereira P (2021) Global COVID-19 pandemic trends and their relationship with meteorological variables, air pollutants and socioeconomic aspects. *Environ Res* 204(Pt C): 112249.
  26. Barcelo D (2020) An environmental and health perspective for COVID-19 outbreak: Meteorology and air quality influence, sewage epidemiology indicator, hospitals disinfection, drug therapies and recommendations. *Journal of Environmental Chemical Engineering* 8(4):104006.
  27. Del Pozo-Herce P, Garrido-GR, Santolalla-Arnedo I, Gea CV, García-Molina P, et al. (2021) Psychological impact on the nursing professionals of the rioja health service (Spain) due to the SARS-CoV-2 virus. *Int J Environ Res Public Health* 18(2): 580.
  28. BRASIL (2016) Resolução Cofen-358/2009. Cofen - Conselho Federal de Enfermagem.
  29. dos Santos EC, Machado RLD, Paz JL, Silvestre M do PSCA, Lima KVB, et al. (2020) Study of TNF- $\alpha$ , IFN- $\gamma$ , TGF- $\beta$ , IL-6, and IL-10 gene polymorphism in individuals from the leprosy endemic area in the Brazilian Amazon. *Meta Gene* 25: 100740.
  30. Guan W, Ni Z, Hu Y, Liang W, Ou C, et al. (2020) Clinical Characteristics of Coronavirus Disease 2019 in China. *New Engl J Med* 382(18): 1708-1720.
  31. Huang C, Wang Y, Li X, Ren L, Zhao J, et al. (2020) Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet (London, England)* 395(10223): 497-506.
  32. Al Abri ZGH, Al Zeedi MASA, Al Lawati AA (2021) Risk factors associated with COVID-19 infected healthcare workers in Muscat Governorate, Oman. *J Primary Care & Commun Health* 12: 2150132721995454.
  33. Silva MJA, Silva CS, Marinho RL, Cabral JG, Gurrão EPDC, et al. (2023) Analysis of Epidemiological Factors and SNP rs3804100 of TLR2 for COVID-19 in a Cohort of Professionals Who Worked in the First Pandemic Wave in Belém-PA, Brazil. *Genes*, 14(10): 1907.
  34. Jin H, Liu L, Li Y, Chen C, Fu Q (2022) Influence of different protection levels of PPE on nurses' physical fatigue during the COVID-19 pandemic. *Work* 72(4): 1143-1152.
  35. de Sousa JR, Conceição ECV, Marsola LR, Maia NC, de Oliveira GYM, et al. (2021) Caracterização dos profissionais da linha de frente em um hospital de referência durante a pandemia pelo COVID-19. *Revista Eletrônica Acervo Saúde* 13(5): e6795-e6795.
  36. Ojha S, Debnath M, Sharma D, Niraula A (2021) Knowledge of Handling the Personal Protective Equipment by Frontline Allied Health Professionals in COVID-19 Outbreak-A Web-Based Survey Study. *J Radiol Nurs* 40(2): 167-171.
  37. Sousa KR de, Miranda MA de L (2021) Percepção dos profissionais de enfermagem sobre o uso dos equipamentos de proteção individual na emergência. *Comunicação em Ciências da Saúde* 32(2).
  38. Saenz LC, Miranda A, Speranza R, Texeira RA, Rojel U, et al. (2020) Recommendations for the organization of electrophysiology and cardiac pacing services during the COVID-19 pandemic: Latin American Heart Rhythm Society (LAHRS) in collaboration with: Colombian college of electrophysiology, Argentinian Society of Cardiac Electrophysiology (SADEC), Brazilian society of cardiac arrhythmias (SOBRAC), Mexican Society of Cardiac Electrophysiology (SOMECC). *J Interventional Cardiac Electrophysiol* 59(2): 307-313.



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