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COVID-19 among health professionals: a prevalence study

COVID-19 entre profissionais de saúde: um estudo de prevalência

COVID-19 entre profesionales de la salud: un estudio de prevalencia

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ABSTRACT

Objective: To identify and describe the prevalence of COVID-19 cases among health professionals. Methods: A descriptive cross-sectional study, carried out among health professionals working in care, regardless of whether or not they had the disease. Data collection took place online, using the snowball technique. A descriptive analysis of the results was performed. **Results:** The sample consisted of 128 health professionals. The overall prevalence was 46.9%. On the front line, the prevalence was 61.7%. The median age was 30 years. Nurses (61.7%) and nursing technicians (20%) had more diagnoses. Obesity was the most prevalent health condition in those who had COVID-19 (20%). There was prophylaxis use for COVID-19 with ivermectin (55.0%), azithromycin (43.3%) and hydroxychloroquine (3.1%), participation in crowds outside work (50%), contact with a positive family member (51.7%), hand hygiene only with gel alcohol (60.0%) and lack of personal protective equipment (43.3%). **Conclusion:** There was a high prevalence of cases, especially among frontline professionals, as well as a high frequency of risky practices for the disease, such as crowds, excessive working hours, prophylaxis use and problems with Personal Protective Equipment.

Descriptors: Prevalence. COVID-19. Health Personnel. Health Risk Behaviors.

RESUMO

Objetivo: Identificar e descrever a prevalência de casos de COVID-19 entre profissionais de saúde. **Métodos:** Estudo transversal descritivo, realizado entre profissionais de saúde atuantes na assistência, independente se teve ou não a doença. A coleta de dados ocorreu de forma *online*, adotando-se a técnica de bola de neve. Realizou-se análise descritiva dos resultados. **Resultados:** A amostra foi composta por 128 profissionais de saúde. A prevalência geral foi de 46,9%. Na linha de frente, a prevalência foi de 61,7%. A mediana de idades foi de 30 anos. Enfermeiros (61,7%) e técnicos de enfermagem (20%) tiveram mais diagnósticos. A obesidade foi a condição de saúde mais prevalente nos que tiveram COVID-19 (20%). Houve uso de profilaxia para a COVID-19 com ivermectina (55,0%), azitromicina (43,3%) e hidroxicloroquina (3,1%), participação em aglomeração externo ao trabalho (50%), contato com familiar positivo (51,7%), higienização das mãos apenas com o álcool em gel (60,0%) e falta de equipamentos de proteção individual (43,3%). **Conclusão:** Houve uma elevada prevalência de casos, especialmente nos profissionais da linha de frente, assim como elevada frequência de práticas de risco para a doença, como aglomerações, excesso de jornada de trabalho, uso de profilaxia e problemas com os Equipamentos de Proteção Individual.

Descritores: Prevalência. COVID-19. Pessoal de Saúde. Comportamentos de Risco à Saúde.

RESUMÉN

Objetivo: Identificar y describir la prevalencia de casos de COVID-19 entre los profesionales de la salud. **Métodos:** Estudio descriptivo transversal, realizado entre profesionales de la salud que actúan en el cuidado, independientemente de que tuvieran o no la enfermedad. La recolección de datos se realizó en línea, utilizando la técnica de bola de nieve. Se realizó un análisis descriptivo de los resultados. **Resultados:** La muestra estuvo conformada por 128 profesionales de la salud. La prevalencia global fue del 46,9%. En primera línea, la prevalencia fue del 61,7%. La mediana de edad fue de 30 años. Enfermeros (61,7%) y técnicos de enfermería (20%) tuvieron más diagnósticos. La obesidad fue la condición de salud más prevalente en aquellos que tenían COVID-19 (20%). Hubo uso de profilaxis para COVID-19 con ivermectina (55,0%), azitromicina (43,3%) e hidroxicloroquina (3,1%), participación en aglomeraciones fuera del trabajo (50%), contacto con familiar positivo (51,7%), mano higiene solo con alcohol en gel (60,0%) y falta de equipo de protección personal (43,3%). **Conclusión:** Hubo una alta prevalencia de casos, especialmente entre los profesionales de primera línea, así como una alta frecuencia de prácticas de riesgo para la enfermedad, como aglomeraciones, exceso de jornada, uso de profilaxis y problemas con los Equipos de Protección Individual.

Descriptores: Prevalencia. COVID-19. Personal de Salud. Conductas de Riesgo para la Salud.

INTRODUCTION

In 2020, the World Health Organization declared the COVID-19 pandemic, after it reached a global scale. COVID-19 is an infectious disease caused by the SARS-CoV-2 virus (Severe Acute Respiratory Syndrome Coronavirus 2), which can cause Acute Respiratory Distress Syndrome.[1] Among the forms of transmission, there is dispersion through respiratory droplets and fomites, with hand hygiene and Personal Protective Equipment (PPE) use being recommended.[2-3]

As the pandemic progressed, the disease-causing virus suffered recurrent genetic mutations that may imply transmission and resistance to treatments and immunobiological agents.[4] It is noteworthy that vaccines against COVID-19 are considered the main ways of preventing infection; with this, it was observed the strengthening for its development during the pandemic.[5] As of epidemiological week 19, 2022, more than 521 million cases of COVID-19 have been confirmed worldwide. Brazil is in the third position of accumulated cases, with a total of 30,682,094.[6]

In Piauí, until May 22, 2022, there were 368,069 confirmed cases and 7,743 deaths. Until the aforementioned moment, the capital, Teresina, has already reached more than 119,000 cases of COVID-19.[7] The number of cases in the interior of the state aroused attention regarding the health services offered, their demands and the absence of these, providing the direction of the population to the capital in search of high complexity care.[8]

In the fight against COVID-19, health professionals are on the front line, one of the groups most susceptible to SARS-CoV-2. In Brazil, as of November 6, 2021, more than 153,000 health professionals had been infected. Health professions with the most records, among the confirmed cases of Influenza Syndrome by COVID-19, are nursing technicians/assistants, followed by nurses and physicians.[9] In 2022, the professions with the most records of hospitalizations are, in sequence, nursing technicians/assistants, physicians and nurses, and women have been the most affected.[6]

Professionals, in their work activity, provide direct or indirect care to patients with COVID-19. Their protection in the work environment can be affected by health issues, working conditions, lack or low quality of protective equipment, reduction in the number of professionals and extended working hours, that can cause exposure to the virus and consequent high prevalence of COVID-19 in this population.[10-11] It is necessary to understand the dynamics of factors that contribute to infection and the frequency of practices and/or behaviors performed by professionals that can influence the number of diagnoses.

Considering the above, the question is: what is the prevalence of COVID-19 cases among health professionals in Teresina? This study focuses on COVID-19 in health professionals and aims to identify and describe the prevalence of COVID-19 cases among health professionals.

METHODS

This is a descriptive cross-sectional study. The study was carried out in the municipality of Teresina, capital of the state of Piauí, located in northeastern Brazil, from April to July 2021. Since the 1980s, Teresina has established itself as a reference center for health services in the Midnorth region, formed by the states of Piauí and Maranhão. Teresina's health system infrastructure has approximately 1,000 health facilities and around 36,000 working professionals.[12]

The population of this study is composed of health professionals (technicians and nursing assistants, nurses, physicians, dentists, Community Health Workers, pharmacists, physiotherapists, psychologists, nutritionists) who were active in patient care in the municipality of Teresina, during the period of the COVID-19 pandemic, in the public or private network.

For sampling, the non-probabilistic sampling method was adopted, and the sample was by convenience, except for the aspect that the results obtained present restrictions to a broad generalization.[13] Since data collection took place online, we adopted the snowball technique to recruit participants.

We include health professionals, working in the assistance in the municipality of Teresina, during the COVID-19 pandemic, from the public and private network, with a minimum age of 18 years or more and Brazilians, regardless of their serological status for COVID-19. We excluded professionals awaiting diagnosis and professors without assistance.

The data collection questionnaire was elaborated from a literature review on the subject in question, being assessed by three judges regarding content.[14] Data collection took place in a virtual environment through Google Forms. Health professionals were initially recruited according to their proximity to the collector, whether through family, friendship or work ties.

For each professional contacted, another professional was requested (and then these people recruited others), in order to expand the network of contacts. Professionals were approached through WhatsApp® or e-mail. Participants' availability and interest in collaborating with the study and answering the questions in the questionnaire were considered. In order to minimize losses, in relation to professionals who agreed to participate in the research, the collection team was advised to maintain a bond with them, in an attempt to remind them about completing the questionnaire.

The dependent variable was whether or not the professional had a diagnosis of COVID-19, which was confirmed by means of a rapid antibody test (IGG/IGM), RT-PCR, serological antibody test (IGG/IGM) or rapid antigen test.

The independent variables were divided into sociodemographic (age, sex, education, skin color, marital status and income), occupational (professional category, training/work time/weekly working hours, training for current in the COVID-19 scenario, place of work in the public and private network), health-related (pre-existing health condition, psychoactive substance use, vaccination against COVID-19, nutritional status, prophylaxis for

COVID-19, health habits, participation in crowds and family contact) and care practice-related (working on the front line, sharing a break room with other professionals without using a mask for sleeping and for meals, distance between professionals, time of exposure to patients with COVID-19, procedures involving airways, frequency of hand hygiene, frequency of PPE use, type of PPE most used, frequency of PPE replacement, type of mask used and mask change frequency).

The data collection instrument variables were organized and coded in a dictionary called codebook. There was double data entry in Microsoft Office Excel for Windows® and analysis in the Statistical Package for the Social Sciences® (SPSS), version 21.0. Descriptive statistics were performed with frequency (relative and absolute) for qualitative variables. In the quantitative variables, the results were presented through the median and interquartile range, since, by the Kolmogorov-Smirnov test, the data showed a non-normal distribution.

The research was approved by the Research Ethics Committee of the *Universidade Federal do Piauí*, under Opinion 4,122,120. For online consent registration, the importance of research participants keeping in their files a copy of the Informed Consent Form (ICF) stood out, made available in the online questionnaire itself.

It is noteworthy that the risks for participants were minimal, since collection was virtual. These could experience discomfort when answering some questions as well as difficulties in using technologies to access the form. The benefits, on the other hand, can be considered medium and long-term, as the data allowed us to visualize how professionals are exposed to infection. They can support behavior change and the creation of care protocols.

RESULTS

A total of 128 health professionals participated in the research; of these, 122 (95.3%) worked exclusively in Teresina and 6 (4.7%) also worked in another municipality. The overall prevalence of COVID-19 was 46.9% (n=60). Most professionals surveyed were female (81.2%), brown (71.9%), single (61.7%) and with an income above US$ 800.00 (eight hundred dollars) (35.9%). The median age was 30 years. This sociodemographic profile was similar among those who claimed to have had COVID-19 (**Table 1**).

As for occupational characteristics, the professional category that most participated in the research was nurses (64.1%), followed by nursing technicians (14.1%); they concentrated the majority of COVID-19 cases (61.7% and 20% respectively). Professionals who had the disease had a longer working week than those who did not have a diagnosis (49 hours/week; IQR=24). As for the sector of activity, most were working in the public network (60.9%). The sectors that had the most infection by SARS-CoV-2 were the wards in both the public (56.2%) and private (54.5%) network. In the public network, most professionals working in primary care (32%) and in the emergency sector (22%) did not have the disease. The prevalence of training on COVID-19, manifested by the population studied (71.9%), was high, with 73.5% not having COVID-19 (**Table 1**).

Regarding the pre-existing health condition, 11.7% of professionals are obese, and 20% of these tested positive for COVID-19. When observing the nutritional status, the eutrophic were the ones who most reported not having had a diagnosis for COVID-19 (61.8%). With regard to health habits, 43.3% of professionals who were infected were using alcohol. Compliance with vaccination against COVID-19 was high (93%). The most used vaccine was CoronaVac (61.7%), and 72.7% were vaccinated with two doses (**Table 2**).

Most of those who said they often practice physical activity between 150 and 300 minutes a week (38.2%) and perform routine exams annually (39.7%) were not diagnosed with COVID-19. The most prevalent blood type in cases of the disease was type O (43.3%). Among the cases, 80% were Rh positive. Professionals reported having used prophylaxis for COVID-19. The most used drugs, among those who had the disease, were vitamin D (65.0%), ivermectin (55.0%) and azithromycin (43.3%). Four professionals used hydroxychloroquine (3.1%), and they were diagnosed with COVID-19 (**Table 2**).

Professionals showed a high frequency of involvement in behaviors considered at risk for COVID-19, such as participating in crowds outside the work environment (50.0%). Among those who were positive, 51.7% said they had had contact with a family member who was positive for COVID-19. Regarding living with family members, 90% of COVID-19 cases lived with people aged between 20 and 59 years (**Table 3**).

In the work environment, the majority (45%) shared a rest room with other health professionals, without using a mask, for more than 15 minutes, and 83.3% said they had a meal in the same environment as other professionals. This prevalence corresponds to professionals who had the disease. A distance of up to one meter was reported by 50.0% of participants, and the time of exposure to patients with the disease, for more than 30 minutes, in an open environment, was reported by 26.6%. Among the cases of the disease, 61.7% were involved in situations of crowd within the workplace (**Table 3**).

Table 1. Sociodemographic and occupational profile of COVID-19 cases in health professionals in Teresina, Piauí, Brazil, 2021 (n=128).

Characteristics	Diagnosis for COVID-19		
	Yes n (%)	No n (%)	Total n (%)
Age*	30.5 (IQR=13)	30 (IQR=9)	
Sex			
Male	11(18.3)	13(19.1)	24(18.8)
Female	49(81.7)	55(80.9)	104(81.2)
Color			
White	12(20.0)	12(17.6)	24(18.8)
Black	7(11.7)	2(2.9)	9(7.0)
Brown	40(66.7)	52(76.5)	92(71.9)
Yellow	1(1.7)	2(2.9)	3(2.3)
Marital status			
With partner	25(41.7)	24(35.3)	49(38.3)
Without partner	35(58.3)	44(64.7)	79(61.7)
Income			
Up to US$400.00	13(21.7)	10(14.7)	23(18.0)
Between US$400.00 and US$600.00	15(25.0)	21(30.9)	36(28.1)
Between US$600.00 and US$800.00	9(15.0)	14(20.6)	23(18.0)
More than US$800.00	23(38.3)	23(33.8)	46(35.9)
Education			
High/vocational school	6(10.0)	5(7.4)	11(8.6)
Graduation	10(16.7)	15(22.1)	25(19.5)
Specialization	35(58.3)	32(47.0)	67(52.3)
Graduate education	9(15.0)	16(23.5)	25(19.5)
Professional category			
Nursing technicians/assistants	12(20.0)	6(8.8)	18(14.1)
Nurses	37(61.7)	45(66.2)	82(64.1)
Physicians	1(1.7)		1(0.8)
Physical therapists	3(5.0)	4(5.9)	7(5.5)
Psychologists and psychoanalysts	2(3.3)	3(4.4)	5(3.9)
Other categories	5(8.3)	10(14.7)	15(11.7)
Time since graduation (years)*	6.0(IQR=8.0)	6.0(IQR=8.0)	
Job tenure (years)*	5.0(IQR=8.75)	6.0(IQR=8.75)	
Weekly working hours (hours)*	49(IQR=24)	44(IQR=24)	
Training on COVID-19			
Yes	42(70.0)	50(73.5)	92(71.9)
No	18(30.0)	18(26.5)	36(28.1)
Sector of activity			
Public	38(63.3)	40(58.8)	78(60.9)
Private	12(20.0)	18(26.5)	30(23.4)
Both	10(16.7)	10(17.7)	20(15.6)
Operation in the public network			
Administrative	9(18.8)	6(12.0)	15(15.3)
Outpatient	7(14.6)	6(12.0)	13(13.3)
Wards	27(56.2)	24(48.0)	51(52.0)
Intensive Care Unit	14(29.2)	13(26.0)	27(27.6)
Primary Care	9(18.8)	16(32.0)	25(25.5)
Emergency	9(18.8)	11(22.0)	20(20.4)
Field hospital	5(10.4)	5(10.0)	10(10.2)
Surgical center	3(6.2)	2(4.0)	5(5.1)
Specialized services	9(18.8)	7(14.0)	16(16.3)
Others	12(25.0)	12(24.0)	24(24.5)
Operation in the private network			
Administrative	3(13.6)	8(28.6)	11(22.0)
Outpatient	7(31.8)	3(10.7)	10(20.0)
Wards	12(54.5)	14(50.0)	26(52.0)
Emergency	7(31.8)	8(28.6)	15(30.0)
Transport or home care	3(16.6)	5(17.9)	8(16.0)
Surgical center	4(18.2)	3(10.7)	7(14.0)
Private office	3(13.6)	4(14.3)	7(14.0)
Specialized services	4(18.2)	4(14.3)	8(16.0)
Others	8(36.4)	10(35.7)	18(36.0)
Total	60 (100)	68(100)	128(100)

*median; IQR - interquartile range

Source: authors (2021).

Table 2. Self-reported health conditions and habits in health professionals in Teresina, Piauí, Brazil, 2021 (n=128).

Characteristics	Diagnosis for COVID-19		
	Yes n (%)	No n (%)	Total n (%)
Pre-existing health condition			
Obesity	12(20.0)	3(4.4)	15(11.7)
Chronic heart disease	1(1.7)	1(1.5)	2(1.6)
Hypertension	1(1.7)	3(4.4)	4(3.1)
Chronic respiratory disease	6(10.0)	6(8.8)	12(9.4)
Nutritional status			
Underweight		1(1.5)	1(0.8)
Eutrophic	24(40.0)	42(61.8)	66(51.6)
Overweight	22(36.7)	17(25.0)	39(30.5)
Obesity I	11(18.3)	7(10.3)	18(14.1)
Obesity II	2(3.3)	1(1.5)	3(2.3)
Obesity III	1(1.7)		1(0.8)
Alcohol consumption	26(43.3)	36(52.9)	62(48.4)
Tobacco use	1(1.7)	2(2.9)	3(2.3)
Narcotic use	2(3.3)		2(1.6)
COVID-19 vaccine			
Yes	58(96.7)	61(89.7)	119(93.0)
No	2(3.3)	7(10.3)	9(7.0)
Type of COVID-19 vaccine			
CoronaVac	36(60.0)	43(62.2)	79(61.7)
AstraZeneca	22(36.7)	18(26.5)	40(31.2)
Number of doses			
One dose	13(21.7)	13(19.1)	26(20.3)
Two doses	45(75.0)	48(70.6)	93(72.7)
Practice regular physical activity between 150 and 300 minutes per week (in the last 12 months)			
Very often	16(26.7)	12(17.6)	28(21.9)
Often	16(26.7)	26(38.2)	42(32.8)
Neutral	3(5.0)	5(7.4)	8(6.2)
Rarely	16(26.7)	16(23.5)	32(25.0)
Never	9(15.0)	9(13.2)	18(14.1)
Conduct medical consultations annually			
Very often	13(21.7)	12(17.6)	25(19.5)
Often	22(36.7)	28(41.2)	50(39.1)
Neutral	7(11.7)	15(22.1)	22(17.2)
Rarely	15(25.0)	11(16.2)	26(20.3)
Never	3(5.0)	2(2.9)	5(3.9)
Use self-medication when necessary			
Very often	5(8.3)	14(20.6)	19(14.8)
Often	31(51.7)	27(39.7)	58(45.3)
Neutral	7(11.7)	11(16.2)	18(14.1)
Rarely	15(25.0)	13(19.1)	28(21.9)
Never	2(3.3)	3(4.4)	5(3.9)
Conduct routine exams annually			
Very often	16(26.7)	16(23.5)	32(25.0)
Often	19(31.7)	27(39.7)	46(35.9)
Neutral	9(15.0)	11(16.2)	20(15.6)
Rarely	12(20.0)	12(17.6)	24(18.8)
Never	4(6.7)	2(2.9)	6(4.7)
Blood type			
A	24(40.0)	23(33.8)	47(36.7)
B	7(11.7)	5(7.4)	12(9.4)
O	26(43.3)	36(52.9)	62(48.4)
Do not know	3(5.0)	4(5.9)	7(5.5)
Rh factor			
Positive	48(80.0)	54(79.4)	102(79.7)
Negative	10(16.7)	10(14.7)	20(15.6)
Do not know	2(3.3)	4(5.9)	6(4.7)
Prophylaxis against COVID-19			
Hydroxychloroquine	4(6.7)		4(3.1)
Chloroquine	1(1.7)	1(1.5)	2(1.6)
Azithromycin	26(43.3)	18(26.5)	44(34.4)
Ivermectin	33(55.0)	25(36.8)	58(45.3)
Dexamethasone	16(26.7)	7(10.3)	23(18.0)
Zinc	24(40.0)	27(39.7)	51(39.8)
Vitamin D	39(65.0)	37(54.4)	76(59.4)
Total	60 (100)	68(100)	128(100)

Source: authors (2021).

Table 3. Social distancing and practice of behaviors considered at risk for COVID-19 in health professionals in Teresina, Piauí, Brazil, 2021 (n=128).

Characteristics	Diagnosis for COVID-19		
	Yes n (%)	No n (%)	Total n (%)
Crowd outside the work environment			
Yes	28(46.7)	36(52.9)	64(50.0)
No	31(51.7)	29(42.6)	60(46.9)
Does not know	1(1.7)	3(4.4)	4(3.1)
Place of domicile during the pandemic			
At home with family members	52(86.7)	52(76.5)	104(81.2)
Alone	1(1.7)	12(17.6)	13(10.2)
Hosted in a different environment from home	1(1.7)	1(1.5)	2(1.6)
Hosted in a different environment from the home with other professionals	1(1.7)	1(1.5)	2(1.6)
Others	5(8.3)	2(2.9)	7(5.5)
Age group of households of professionals who lived with family members			
Age group from 0 to 9 years	20(33.3)	13(19.1)	33(25.8)
Age group from 10 to 19 years	15(25.0)	11(16.2)	26(20.3)
Age group from 20 to 59 years	54(90.0)	54(79.4)	108(84.4)
Age group > 60 years	20(33.3)	12(17.6)	32(25.0)
Contact with a family member who is positive for COVID-19			
Yes	31(51.7)	42(61.8)	73(57.0)
No	28(46.7)	25(36.8)	53(41.4)
Do not know	1(1.7)	1(1.5)	2(1.6)
Shared a rest room with other health professionals, without using a mask, for more than 15 minutes	27(45.0)	23(33.8)	50(39.1)
Had/have a meal in the same break room with another health professional	50(83.3)	54(79.4)	104(81.2)
Distancing between professionals			
Up to 1 meter	32(53.3)	32(47.1)	64(50.0)
Between 1 and 2 meters	23(38.3)	33(48.5)	56(43.8)
More than 2 meters	5(8.3)	3(4.4)	8(6.2)
Exposure time to patients with COVID-19			
Less than 30 minutes	15(25.0)	17(25.0)	32(25.0)
More than 30 minutes outdoors	17(28.3)	17(25.0)	34(26.6)
More than 30 minutes less than 1 meter away	14(23.3)	17(25.0)	31(24.2)
Crowding in the work environment*			
Yes	37(61.7)	38(55.9)	75(58.6)
No	22(36.7)	29(42.6)	51(39.8)
Do not know	1(1.7)	1(1.5)	2(1.6)
Total	60 (100)	68(100)	128(100)

*Procedures, get-togethers, rest, training courses

Source: authors (2021).

Most professionals who had COVID-19 were working on the front line, and the prevalence was higher than the general prevalence (61.7%). Regarding the procedures involving the airways, the most performed among the cases was the nasal and oral swab (38.3%), followed by tracheostomy tube aspiration (27.3%) and endotracheal tube aspiration (22.7%) (**Table 4**).

Most professionals reported very frequently (50.8%) or frequently (41.4%) performing hand hygiene with soap and water, rubbing palm, back, interdigital spaces, back of fingers, wrist, thumb, digital pulps and nails. It was observed that, among the cases, hygiene only with gel alcohol, several times a day, was the most reported as a very frequent activity (60.0%). The prevalence of health education among those surveyed (63.3%) (**Table 4**) was high.

The PPE most used by health professionals in the work environment were cap (91.4%), gloves (85.2%) and apron (73.4%). The most used types of masks were N95 or PFF2 (82.8%) and surgical mask (79.7%). There was a high compliance with PPE use among cases and non-cases of COVID-19. Regarding the incorrect PPE use, there was a high prevalence in relation to mask non-adequate fit (54.7%), and 53.3% of these professionals had COVID-19 (**Table 5**).

Lack of PPE was observed in 43.3% of positive cases of the disease. After donning, 31.2% of participants said they rarely touched the mask, glasses and/or face shield; of these, 35.3% had no diagnosis. Regarding the surgical mask replacement, the majority (53.1%) frequently performs the exchange, and, of these, 55.9% did not have COVID-19 (**Table 5**).

Table 4. Performance in assistance and prevention practices against COVID-19 in health professionals in Teresina, Piauí, Brazil, 2021 (n=128).

Characteristics	Diagnosis for COVID-19		
	Yes n (%)	No n (%)	Total n (%)
Frontline performance			
Yes	37(61.7)	50(73.5)	87(68.0)
No	23(38.3)	18(26.5)	41(32.0)
Perform procedures involving airways			
Endotracheal intubation	11(18.3)	10(14.7)	21(16.4)
Nebulization	10(16.7)	20(29.4)	30(23.4)
Endotracheal tube aspiration	17(28.3)	12(17.6)	29(22.7)
Chest physiotherapy	4(6.7)	7(10.3)	11(8.6)
Tracheostomy cannula aspiration	17(28.3)	18(26.5)	35(27.3)
Nasopharyngeal aspirate	14(23.3)	18(26.5)	32(25.0)
Nasal and oral swab	23(38.3)	26(38.2)	49(38.3)
Frequency of hand hygiene practices following the appropriate technique*			
Very often	35(58.3)	30(44.1)	65(50.8)
Often	22(36.7)	31(45.6)	53(41.4)
Neutral		3(4.4)	3(2.3)
Rarely	3(5.0)	3(4.4)	6(4.7)
Never		1(1.5)	1(0.8)
Hand hygiene several times a day only with gel alcohol			
Very often	36(60.0)	37(54.4)	73(57.0)
Often	19(31.7)	28(41.2)	47(36.7)
Neutral	4(6.7)	1(1.5)	5(3.9)
Rarely	1(1.7)	2(2.9)	3(2.3)
Hand hygiene several times a day with soap and water for less than 40 seconds			
Very often	23(38.3)	24(35.3)	47(36.7)
Often	23(38.3)	30(44.1)	53(41.4)
Neutral	5(8.3)	8(11.8)	13(10.2)
Rarely	6(10.0)	5(7.4)	11(8.6)
Never	3(5.0)	1(1.5)	4(3.1)
Hand hygiene after procedures			
Very often	47(78.3)	49(72.1)	96(75.0)
Often	11(18.3)	15(22.1)	26(20.3)
Neutral	2(3.3)	4(5.9)	6(4.7)
Hand hygiene before and after procedures			
Very often	44(73.3)	44(64.7)	88(68.8)
Often	11(18.3)	19(27.9)	30(23.4)
Neutral	2(3.3)	3(4.4)	5(3.9)
Rarely	3(5.0)	2(2.9)	5(3.9)
Received educational material to act in the COVID-19 scenario			
Yes	40(66.7)	41(60.3)	81(63.3)
No	20(33.3)	27(39.7)	47(36.7)
Total	60 (100)	68(100)	128(100)

*With soap and water, rubbing palm, dorsum, interdigital spaces, dorsum of fingers, wrist, thumb, digital pulps and nails

Source: authors (2021).

Table 5. Personal Protective Equipment use by professionals in Teresina, Piauí, Brazil, 2021 (n=128).

Characteristics	Diagnosis for COVID-19		
	Yes n (%)	No n (%)	Total n (%)
PPE used in the workplace			
Gloves	50(83.3)	59(86.8)	109(85.2)
Cap	55(91.7)	62(91.2)	117(91.4)
Disposable shoes	26(43.3)	31(45.6)	57(44.5)
Face shield	30(50.0)	31(45.6)	61(47.7)
Apron	46(76.7)	48(70.6)	94(73.4)
Surgical pajamas	37(61.7)	39(57.4)	76(59.4)
Goggles	22(36.7)	24(35.3)	46(35.9)
Type of mask most used in the work environment			
Surgical mask/procedure	49(81.7)	53(77.9)	102(79.7)
N95 or PFF2 mask	51(85.0)	55(80.9)	106(82.8)
Fabric mask	2(3.3)	4(5.9)	6(4.7)
Incorrect PPE use			
Not properly fitting the mask	32(53.3)	38(55.9)	70(54.7)
Protective clothing that is larger than the person's size	25(41.7)	29(42.6)	54(42.2)
Absence of safety glasses or very large glasses	20(33.3)	33(48.5)	53(41.4)
Poorly sized and shaped or of poor quality glove	22(36.7)	27(39.7)	49(38.3)
Lack of PPE	26(43.3)	21(30.9)	47(36.7)
Low quality of PPE	30(50.0)	37(54.4)	67(52.3)
Frequency of touching the mask, glasses, face shield after donning			
Very often	8(13.3)	2(2.9)	10(7.8)

Often	18(30.0)	21(30.9)	39(30.5)
Neutral	18(30.0)	20(29.4)	38(29.7)
Rarely	16(26.7)	24(35.3)	40(31.2)
Never		1(1.5)	1(0.8)
Changing frequency (hours) of surgical masks			
Very often	21(35.0)	15(22.1)	36(28.1)
Often	30(50.0)	38(55.9)	68(53.1)
Neutral	6(10.0)	9(13.2)	15(11.7)
Rarely	1(1.7)	2(2.9)	3(2.3)
Never	2(3.3)	4(5.9)	6(4.7)
Changing frequency (hours) of N95 masks			
Very often	4(6.7)	2(2.9)	6(4.7)
Often	26(43.3)	24(35.3)	50(39.1)
Neutral	20(33.3)	22(32.4)	42(32.8)
Rarely	7(11.7)	15(22.1)	22(17.2)
Never	3(5.0)	5(7.4)	8(6.2)
Total	60 (100)	68(100)	128(100)

PPE - Personal Protection Equipment
Source: authors (2021).

DISCUSSION

In this study, the prevalence of COVID-19 was high. The frequency of cases in general and in professionals who were working on the front line points to a high exposure to the disease in this population. A variant percentage is observed in the literature. In a group of health workers in Muscat (Oman), a percentage of 21.2% was registered.[15] In Porto Alegre (Brazil), there was a prevalence of 14.7%[16], and in New York (United States), 29% tested positive.[17]

The professionals who had the disease had a mean age of 36 years, most were female (64%) and nurses (38%),[15] corroborating the data presented in this study, in which the female gender and the class of nurses had high rates of COVID-19. It is noteworthy that, even in women with higher frequencies of contamination (78.1%), there is no significant difference that points to the female sex as a risk factor.[16]

Regarding the professional category, physicians (61/139), followed by nurses (44/139), are the ones who most tested positive for the disease.[18] Moreover, it is evident that, between March and October 2020, more than 20,000 nursing professionals tested positive for COVID-19 in Brazil, with nursing technicians being the predominant class of positives (62.9%).[19]

It is emphasized that nursing is among the categories of professionals who maintain direct contact with patients in their care routine, which favors their exposure. The high number of nurses who tested positive for SARS-CoV-2 can be explained by the prolonged time spent performing care practices at the bedside, such as medication administration, patient handling, invasive and non-invasive procedures, and handling any emergency patient occurrence.[10]

As for working hours, this study showed that longer working hours were more frequent in cases of COVID-19. With the COVID-19 pandemic, most health workers claimed to have weekly working hours of up to 60 hours.[20] It can be inferred that longer working hours increase the risk of exposure to COVID-19 as well as increased overload and fatigue, which can affect preventive care.[21]

Regarding comorbidities, when analyzing a group of Brazilian health professionals, it was found that chronic obstructive pulmonary disease, asthma, metabolic disorders, including diabetes mellitus, cardiovascular diseases and obesity, were the pre-existing diseases common in positive cases for the disease.[22] Health professionals who have some comorbidity are included within the risk group for developing complications and, in fact, many ended up testing positive for the disease.

In this study, professionals used medications to prevent COVID-19, even though the proven non-efficacy of a drug for this purpose was widely discussed.[23-25] It is observed that, even being health professionals, the variety of medications used for prevention purposes is surprising, since it is assumed that there is a high circulation of information about COVID-19 in this public and close contact with the unfolding of the disease.

When considering the work environment, the risk of infection for the professional can be influenced by different reasons, such as close contact with patients and exposure time. It was recommended that the minimum safe distance would be approximately one meter away when having prolonged contact or having contact with secretions or excretions.[26] For the interaction between health professional and patient, surgical mask use was greatly reinforced.[27] Following these recommendations can seem like a challenge, considering that there are different types of health services and different ways of interacting with patients.

Outside the work environment, most health professionals who tested positive for COVID-19 lived at home with family members, which suggests a relevant role of community transmission of COVID-19 in infection. Household contacts can play a significant role in SARS-CoV-2 transmission, mainly due to the rapid circulation of virus in the community.[10] Likewise, there may be contamination from professionals to the community.

Frontline health workers stand out in positive tests for COVID-19,[28] which corroborates the finding of this study. In this scenario, they are repeatedly exposed to COVID-19 patients, where certain procedures, such as intubation, contact with secretions, and aerosol-generating procedures, increase the risk of infection, highlighting the importance of using PPE.[22]

Regarding the frequency of protective practices, washing hands very often, using the correct technique, was reported by more than half of participants in this study. It is known that the

practice of hand hygiene is effective in the fight against viruses, fungi and bacteria, preventing the most varied types of infections, however, even if professionals demonstrate good compliance, studies show the need for continuing education activities and monitoring of performance in hand hygiene.[29-32]

However, the number of participants who sanitized very often with alcohol alone is higher. This behavior can become a risky practice, as handwashing with alcohol-based disinfectants proves to be less effective than handwashing with soap and water.[33-34] Despite this, in some situations, when hand washing is not available or is not convenient or not practical, professionals end up prioritizing cleaning with alcohol, but it is necessary to be aware of the ideal amount of alcohol and correct technique so that this process is really effective and brings safety to professionals and patients.[34-35]

In sequence, with regard to PPE use, from the results obtained with this study, it is possible to perceive a good compliance and correct PPE use at lower rates of contamination by SARS-CoV-2. In contrast, inappropriate PPE use by health workers is a significant risk factor for SARS-CoV-2 transmission, as they face a high risk when providing care for suspected or confirmed cases of COVID-19.[36]

Failure to properly adjust the mask was the most prevalent among the incorrect PPE use listed by this study, followed by low quality of PPE. Mask use reduces risks of contamination, consequently, mask non-use, inappropriate use, fall and displacement from professionals' face are factors that influence contamination rates.[37-40] With this, it is important to emphasize the need for mask use by professionals and the importance of offering good quality and effective protective equipment for the health team.

Another aspect to consider is the scarcity or the amount of insufficient PPE for the team, which is a risk to health professionals and, by extension, to patients, colleagues and the community.[41] In this study, the lack of PPE prevailed in the positive cases, when compared to the negative ones. During the pandemic, it was possible to observe inequality of access and quality of this equipment between countries, exposing several professionals to the risk of contamination.[42] However, workers' health must be a public health priority, requiring support from health institutions and public health authorities to comply with protection and prevention measures, aiming at the well-being of these professionals.[43-44]

N95 masks, surgical masks, and face shields are effective equipment in protecting against COVID-19 infection, but additional care is needed regarding the timing of wearing, putting on, and taking off these devices.[45] The results of this study show that most participants reported touching the mask, glasses or face shield rarely after doffing, and the majority also reported changing the mask frequently, and of these, more than half did not test positive for the disease.

This study is limited by the absence of sample calculation and vaccination date, which makes it impossible to say whether the diagnoses occurred before or after the vaccine. As contributions, it is highlighted that it was possible to identify the existence of behaviors inherent to professionals that involve the way they followed the safety measures outside the work environment. Within the service, there are behaviors related to the work activity itself and the exercise of the function.

Therefore, activities that support awareness and reinforce the adoption of security measures are necessary while the pandemic is in force and in a post-pandemic context as well as the supply of material and human resources by managers sufficient to carry out safe care practices for patients and workers. More analytical studies of risk factors are needed to understand how professionals are exposed to the virus in their work environment.

CONCLUSION

In this study, there was a high prevalence of COVID-19 cases observed both in general and in professionals who were working directly on the front line, with this being higher than the first. The results show that there is no standardization of risk, as it actually exists, and contamination of professionals will depend on a set of factors that will be different for each reality.

There was a high frequency of risk practices, such as the prophylaxis use against COVID-19, even if not recommended, participation in internal and external crowds to the work environment, excessive workload, difficulties in maintaining distance in the work environment, flow of community transmission through household contact, frequent practice of hand hygiene only with gel alcohol and problems related to the lack and inappropriate PPE use.

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