Official Journal of the Brazilian Association of Infection Control and Hospital Epidemiology

Journal of INFECTION CONTROL

ISSN 2316-5324 | Ano X . Volume 10 . Número 02 . Abr/Jun . 2021

> ACESSE AQUI A REVISTA ONLINE

ARTIGO ORIGINAL

Occupational exposure and SARS-CoV-2 infection in a terciary care hospial in Brazil

Exposição ocupacional e infecção por SARS-CoV-2 em um hospital terciário no brasil

Exposición ocupacional e infección por SARS-CoV-2 en un hospital de cuidado terciario en brasil

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Recebido em: *08/07/2021*
Aceito em: *16/07/2021*
Disponível online: *16/07/2021*

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ABSTRACT

Background: Health care workers (HCW) are at a higher risk of infection in their workplace and can play an important role in amplifying local outbreaks of SARS-CoV-2. The aimed to describe the first cases of SARS-CoV-2 infection among HCW in a tertiary hospital. **Methods:** A retrospective cohort study of HCW with confirmed COVID-19 from March to July 2020 in central-west Brazil. We conducted 218 contact tracing of HCW with exposure to COVID-19 patients and described exposure risk, adherence to infection control recommendations, epidemiological, clinical, laboratory, radiologic findings and clinical management data. **Results:** Risk of exposure was identified for 175 HCW and 137 of them were advised self-isolation. From 130 symptomatic HCW, 50 (38.5%) had positive reverse transcription polymerase chain reaction (RT-PCR). A cough (75%), fever (54.1%) and shortness of breath (50%), were the most prevalent symptoms. Five (20.8%) professionals required hospitalization and 16.6% (4) were admitted to the ICU. Ground-glass opacities (60%) were the most frequent findings on pulmonary computed tomography. Sixteen (66%) referred exposure to confirmed cases and most exposures (66%) were classified as high risk. Even though available,41.7% (10) were not wearing standardized PPE (personal protective equipment) at the time of exposure and 80% (8) of these were not wearing N95 respirator during aerosol generating procedures. **Conclusion:** This study highlights how poor adherence to standard infection control recommendations can lead to in-hospital transmission during periods of staff shortages.

Keywords: *COVID-19; Health personnel; Personal protective equipment; Occupational diseases.*

RESUMO

Justificativa e Objetivos: Profissionais de saúde (PS) correm um risco mais elevado de infecção no local de trabalho e podem desempenhar um papel importante na amplificação de surtos locais de SARS-CoV-2. O objetivo foi descrever os primeiros casos de infecção por SARS-CoV-2 entre profissionais de saúde em um hospital terciário. **Métodos**: Estudo de coorte retrospectivo de profissionais de saúde com COVID-19 confirmado de março a julho de 2020 no Centro-Oeste do Brasil. Realizou-se 218 rastreamentos de contato de profissionais de saúde com exposição a pacientes com COVID-19 e descreveu-se o risco de exposição, cumprimento das recomendações de controle de infecção, achados epidemiológicos, clínicos, laboratoriais,

radiológicos e manejo. **Resultados:** O risco de exposição foi identificado em 175 profissionais de saúde e 137 deles foram aconselhados ao isolamento. De 130 sintomáticos, 50 (38,5%) PS tiveram RT-PCR positivo. Tosse (75%), febre (54,1%), falta de ar (50%) foram os sintomas mais prevalentes. Cinco (20,8%) profissionais necessitaram de internação e 16,6% foram internados em UTI. Opacidades em vidro fosco (60%) foram os achados mais frequentes na tomografia computadorizada pulmonar. Dezesseis (66%) referiram exposição a casos confirmados e a maioria das exposições (66%) foi classificada como de alto risco. Houveram 41,7% dos profissionais confirmados não usando Equipamentos de Proteção Individual (EPI) padronizados no momento da exposição e 80% deles não estavam usando respirador N95 durante os procedimentos de geração de aerossol. **Conclusão:** Este estudo destaca como a baixa adesão às recomendações padrão de controle de infecção pode levar à transmissão intra-hospitalar durante períodos de falta de pessoal.

Palavras-chave: *COVID-19; Profissional de saúde; Equipamento de proteção pessoal; Doenças ocupacionais.*

RESUMEN

Justificación y Objetivos: Profesionales de la salud (PS) tienen un mayor riesgo de infección en su lugar de trabajo y pueden desempeñar un papel importante en la amplificación de los brotes locales de SARS-CoV-2. O objetivo fue describir los primeros casos de infección por SARS-CoV-2 entre los profesionales sanitarios de un hospital terciario. **Métodos:** Estudio de cohorte retrospectivo de PS con COVID-19 confirmado de marzo a julio de 2020 en el Medio Oeste de Brasil. Realizamos un seguimiento de 218 contactos de PS con exposición a pacientes con COVID-19 y describió el riesgo de exposición, el cumplimiento de las recomendaciones de control de infecciones, los hallazgos epidemiológicos, clínicos, de laboratório, radiológicos y los datos de manejo clínico. **Resultados:** El riesgo de exposición se identificó en 175 profesionales de la salud y se recomendó a 137 de ellos autoaislamiento. De 130 sintomáticos, 50 (38,5%) PS tuvieron RT-PCR positiva. Tos (75%), fiebre (54,1%), dificultad para respirar (50%) fueron los síntomas más prevalentes. Cinco (20,8%) profesionales requirieron hospitalización y el 16,6% (4) ingresaron en UCI. Las opacidades en vidrio deslustrado (60%) fueron los hallazgos más frecuentes en la tomografía computarizada de pulmón. Dieciséis (66%) informaron exposición a casos confirmados y la mayoría de las exposiciones (66%) se clasificaron como de alto riesgo. Se confirmó que el 41,7% de los profesionales no usaban Equipo de Protección Personal (EPP) estandarizado en el momento de la exposición y el 80% de ellos no usaban respirador N95 durante los procedimientos de generación de aerosol. **Conclusión:** Este estudio destaca cómo el cumplimiento deficiente de las recomendaciones estándar de control de infecciones puede provocar la transmisión intrahospitalaria durante los períodos de escasez de personal.

Palabras chave: *COVID-19; Personal sanitario; Equipo de protección personal; Enfermedades profesionales.*

INTRODUCTION

Infections caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2 - hereafter'COVID-19'), among health care workers (HCW) were first described in China[1] right after the start of the outbreak in late December 2019. Since then, SARS-CoV-2 spread fast worldwide, posing a severe threat to global health.[1] The first case in Brazil was confirmed on February 26th, 2020 and by May 5th 2021, COVID-19 had resulted in more than 14 million cases and 400,000 deaths in Brazil.[2] The latest official report from Brazil's health ministry indicated that by March 1st, 2021, 39,510 HCW with COVID-19 had been reported in Brazil, with these numbers probably underestimates.[2]

At the beginning of the pandemic, there were severe shortages of medical resources and lack of adequate training of professionals in how to dun and doff PPE (personal protective equipment) which contributed to infection of HCWs. Healthcare professionals are at increased risk of infection due to high exposure from infected patients and co-workers in hospitals. In addition, they can contribute to amplifying local SARS-CoV-2 outbreaks as oligosymptomatic carriers, representing a risk to other patients and staff. [4,5]

A recent systematic review and meta-analysis evaluating 46 studies worldwide estimated the prevalence of SARS-CoV-2 infection in healthcare professionals ranging from 0.4%, in a Spanish study that evaluated 498 people, to 57.0 % in an American study of 2,306 medical residents. Of the 75,859 selected health professionals, the estimated combined prevalence was 11%.[5-7]These findings show a higher prevalence of COVID-19 infection among HCWs than the data from the general population reported from China.[8]

The epidemic characteristics and risk factors of COVID-19 among health professionals are still being studied and this knowledge may be key to the prevention and control of occupational COVID-19.[1]This study aims to describe the type of exposure and clinical-epidemiological characteristics of HCWs with confirmed COVID-19 by RT-PCR for SARS-CoV-2 in a tertiary care hospital in Brazil during the first phase of the pandemic.

METHODS

We conducted a retrospective cohort study at a tertiary care hospital located in the city of Goiânia-Goias (central-west Brazil), a city with population of 1,536,097 residents. This study is part of an open cohort of patients with flu-like syndrome, Severe Acute Respiratory Syndrome (SARS) and SARS-CoV-2 infection attended in public, private and temporary hospitals prepared for the care of patients with COVID-19 infection at the State of Goiás. It was approved by the Ethics Committee of Universidade Federal de Goiás (CAAE number 30808120.4.0000.5078) and written informed consent was dispensed due to the pandemic situation. It is a 53-bed tertiary-care hospital with 20 ICU beds and has a monthly median hospitalization rate of 396 patients-day. During the first four months of the pandemic, the community prevalence of COVID-19 in Goiânia was low. Until April 30, the state had 705 and Goiânia had 448 confirmed COVID-19 cases.

As soon as HCW had unprotected contact with COVID-19 suspected or positive patients, hospital infection control team recommended them to undergo self-isolation and test screening for COVID-19 according to risk of exposure at CDC (Center for Diseases Control and Prevention) guideli-

Table 1. Assessment of risk and application of work restrictions for asymptomatic healthcare workers (HCW) with potential exposure to patients, visitors, or other HCW with confirmed or suspected SARS-CoV-2 infection.

Epidemiologic Risk Factor	Exposure Risk Level	Work Restriction
Prolonged contact with COVID-19 patient wearing mask		
HCW not wearing PPE	Medium	14 days after last exposure
HCW not wearing mask or face shield	Medium	14 days after last exposure
HCW not wearing eye protection	Low	None
HCW not wearing gown or gloves	Low	None
HCW wearing all PPE	Low	None
Prolonged contact with COVID-19 patient NOT wearing mask		
HCW not wearing PPE	High	14 days after last exposure
HCW not wearing mask or face shield	High	14 days after last exposure
HCW not wearing eye protection	Medium	14 days after last exposure
HCW not wearing gown or gloves	Low	None
HCW wearing all PPE	Low	None

PPE: Personal Protective Equipment. HCW: healthcare worker

nes.[9] In the event of a HCW testing positive, all hospital contacts were systematically traced and tested for SARS-CoV-2. Epidemiological, clinical, laboratory, radiologic findings and clinical management data were obtained from HCW's records and included in our analysis. If some of the data were missed from the records or clarification was needed, we obtained data by direct communication with the attending doctors and healthcare providers. Type of exposure, PPE use/adherence and date of COVID-19 exposure were provided by the hospital's infection prevention and control team. A few of them referred a non-occupational exposure (e.g. contact with a confirmed case who is a family or community member). Table 1 describes CDC guidance.[9]

Data were logged in the Research Electronic Data Capture (REDCap®) tool hosted at the Universidade Federal de Goiás.

We conducted a descriptive analysis for the main socio-demographic, clinical and laboratory characteristics of participants. We classified disease severity according to the WHO guidelines (World Health Organization).[11] We used measures of central tendency (mean, median) and dispersion (interval interquartile range [IQR] 25% and 75%) to describe continuous variables and percentages for categorical variables. The data were analyzed with the Statistical Package for the Social Sciences (IBM SPSS Statistics), version 21.0.

RESULTS

Between March and July 2020, contact tracing was conducted for 218 HCW with exposure to COVID-19 patients. The risk of exposure was analyzed for 175 HCW and 137 of them were advised to self-isolate, as described in figure 1. Of a total of 130 symptomatic HCW, 50 (38,5%) had positive RT-PCR. From 45 asymptomatic, 10 underwent the test and 2 (20,0%) were positive.

Clinical data were available from 24 HCWs with COVID-19 infections confirmed by RT-PCR collected from nasopharyngeal swabs and analyzed by local laboratory. These data are described at figure 1.

From the confirmed HCWs (50), 32 (64%) were female, 27 (54%) worked in Nursing and 12 (24%) in Administration.

The epidemiological characteristics and clinical outcomes are shown in table 2.

Of the 24 COVID-19 infected HCWs, most were female (66,7%, 16). The median age was 34,4 years, varying from 23,8 to 63,3 years. More than half (87,5%, 21) had direct contact

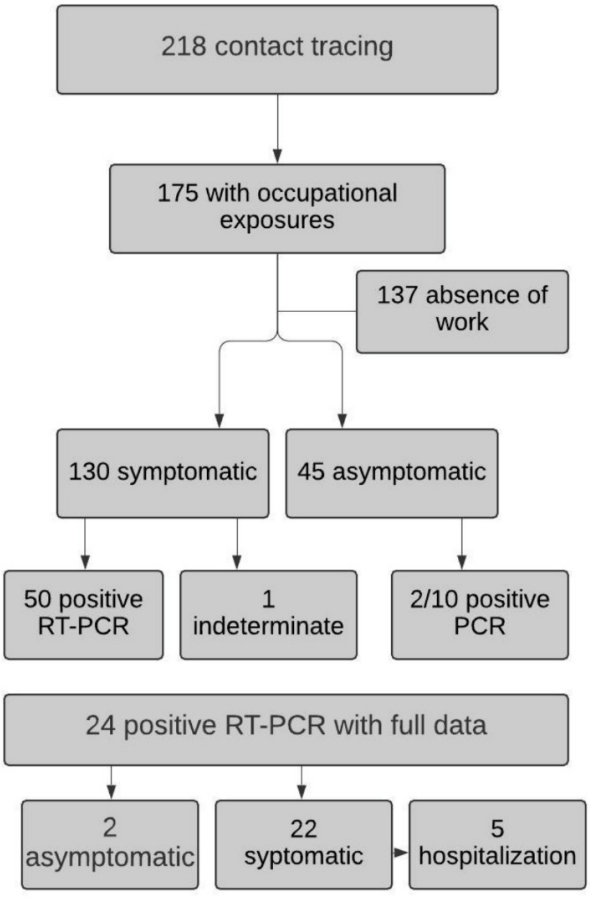

Figure 1. Flow diagram for identification of healthcare workers included in the statistical analysis.

with patients (nursing, medical and physiotherapy staff). The majority (58,3%, 14) had no underlying health condition. Of the 10 professionals who had an underlying illness, 21,7% (5) were obese and 12,5% (3) had hypertension.

Two (8,3%) professionals were asymptomatic, tested in a post-exposure vigilance strategy. Of the 22 who sought medical evaluation, the median time from onset of symptoms to emer-

Table 2. Epidemiological characteristics and clinical outcomes of health care workers with laboratory-confirmed SARS-CoV-2 infection.

Variable	24 HCW N (%)
Gender	
Female	16 (66,7%)
Male	8 (33,3%)
Age – years	
Median (range)	34.4 (23,8-63,3)
Self-declared race	
White	10 (41,7%)
Other/ Multiracial	10 (41,7%)
African Descendent	4 (16,7%)
Labor area	
Administration	2 (8,3%)
Medical staff	3 (12,5%)
Physiotherapy	2 (8,3%)
Nursing	14 (58,3%)
Other	3 (12,5%)
Underlying Illness – no. (%)	
Obesity	5 (21,7%)
Hypertension	3 (12,5%)
Coronary Heart Disease	0
Diabetes	0
Asthma	2 (8,3%)
Multiple Comorbidities	2 (8,3%)
Symptoms	
No	2 (8,3%)
Yes	22 (91,7%)
Variable	**24N (%)**
Cough	18 (75,0)
Fever	13 (54,1)
Shortness of breath	12 (50,0)
Myalgia	10 (41,6%)
Headache	10 (41,6%)
Malaise	9 (37,5%)
Diarrhea	7 (29,1%)
Anosmia	5 (20,8%)
Ageusia	4 (16,6%)
Sore Throat	4 (16,6%)
Disease Severity (WHO)	
Mild	15 (62,5%)
Moderate	5 (20,8%)
Severe	3 (12,5%)
Critical	1 (4,2%)
Management – no. (%)	
Hospitalization	5 (20,9%)
ICU	4 (16,6%)
Ward	
Home quarantine	19 (79,1%)
Length of stay in hospital - day	N=5
Mean (range)	5,2 (2-9)
Antibiotic use	11 (45,8%)
Clinical Outcome – no. (%)	N=24
Death	1 (2%)
Recovered and discharged	23 (95,8%)
Clinical outcome– no. (%)	
Positive HCW	N=52
Recovered	51 (98,0%)
Overall Death	1 (1,9%)
HCW with clinical data	N=24
Death	1 (4,2%)
Hospitalized	5 (9,6%)
Death	1 (20,0%)

HCW: Health Care Worker; WHO: World Health Organization; IQR: Interquartile ratio.

gency visit was 3,5 days (IQR 2-6). Of symptoms, the most common were a cough (75%, 18) followed by fever (54,1%, 13) and half of the patients (50%, 12) reported shortness of breath. Myalgia and headache were reported by 41,6% (10) of patients. Only 20,8% (5) of patients exhibited anosmia and, 16,6% (4) ageusia. Most cases were classified as mild disease (62,5%, 15).

Of the 24 HCW diagnosed with COVID-19, from 15 (62,5%) who sought the emergency department for evaluation, 2 (13.3%) presented fever at triage; 2 (13,3%) had respiratory rate > 24 breaths/min and the same amount had heart rate > 100 beats/min. The median oxygen saturation was 97% (range 91-99%) and one patient had oxygen saturation < 93%. Five patients (21,7%) needed supplemental oxygen during the course of the infection.

Table 3 summarizes laboratory and image results of the HCWs with laboratory-confirmed COVID-19 who sought medical evaluation.

Table 3. Laboratory and image results of health care workers with laboratory-confirmed SARS-CoV-2 infection at hospital admission.

Initial laboratory measures	n=14
White blood cell count, x10^9/L – Median (IQR)	5,30 (4,83-6,60)
Differential WBC count	
Neutrophil – Median % (IQR)	65,5% (53-71,5)
Lymphocyte, <1000 x 10 99 - no. (%)	4 (28,5%)
Platelet, <150 × 109/L) – no. (%)	1 (7,1%)
Aspartate aminotransferase, U/L Median (IQR)	24 (18,5-30)
Alanine aminotransferase, U/L Median (IQR)	25,5 (19-32,25)
Creatine kinase, U/L Median (IQR)	85 (44-108)
Arterial lactate Median, mmol/L, median (IQR)	2.4 (0,9-2,4)
Troponin above test-specific upper limit of normal	0
D-dimer, ng/mL Median (IQR)[a]	0,25 (0,2-0,6)
C-reactive protein, mg/dL Median (IQR)[b]	6,31 (1,75-20,93)
Lactate dehydrogenase, U/L Median (IQR)	199,5 (183,25-281,25)
Imaging Findings no. (%)	**N=15**
Normal	4(26,6%)
Ground glass opacities	9(60%)
Consolidations	1(6,6%)
Tree-in-bud sign	1(6,6%)

IQR: Interquartile ratio. [a] Reference value ≤ 0.5 ng/mL. [b] Reference value < 5 mg/L.

Table 4. Exposure data from health care workers with laboratory-confirmed SARS-CoV-2 infection.

Exposure History	n=24
Confirmed COVID-19 Patient Patient-to-HCW	16 (66,6%)
Patients not wearing mask	12 (75%)
HCW with incomplete PPE	10 (62,5%)
HCW not wearing N95 mask during AGP	8 (80%)
Confirmed COVID-19 HCWs HCW-to-HCW	10 (41.6%)
Symptomatic Index case	10 (100%)
Not wearing mask	8 (80%)
Community	2 (8,3%)
Unknown origins	1 (4,2%)
Exposure Risk Level 9 no. (%)	
High	16 (66,7%)
Medium	1 (4,2%)
Low	7 (29,2%)

HCW: health care worker; PPE: personal protective equipment. AGP: aerosol generating procedure

Five HCW (20,8%) required hospitalization and 4 (16,6%) were admitted in an intensive care unit (ICU). The median time from onset of symptoms to medical visit was 4 days (IQR 4-7). The average hospital stay was 5,2 days (range 2-9). One male nurse died, after 5 days in ICU. The lethality rate was 2% and 20% in the group that required hospitalization. The other 98,0% (23) recovered fully. Even though most of cases

were mild, a large number of patients (45,8%, 11) was treated with antimicrobial therapy.

The hospital's infection prevention and control data from vigilance and screening identified one cluster: one contact with a COVID-19 positive patient during non-invasive ventilation resulted in 7 infected HCWs. The exposure data from 24 of 52 health care workers with laboratory-confirmed SARS-CoV-2 infection are detailed in table 4.

DISCUSSION

The first confirmed SARS-CoV-2 infection in Goiás was described on March 2nd 2020 and our hospital was one of the first hospitals to receive confirmed patients on March 12th 2020.[10] Among HCor, the first case was detected on March 24th, 2020.

Our study analyzed the risk of occupational exposure, the epidemiology, clinical features, laboratory and radiologic findings and outcomes of SARS-CoV-2 infection among HCWs in a tertiary hospital, which was one of the first hospitals in central-west of Brazil to detect COVID-19 during the first wave.

A HCW with SARS-CoV-2 infection can spread the virus to patients, co-workers, or other people in the community. Data from the WHO shows that at least 50% of patients who died of COVID-19 were residents in hospitals or nursing homes, reinforcing the importance of protecting these populations.[5]

Most infected HCWs were female which is consistent with data from Europe,[13,14] China,[1,4,8] the U.S[15] and other studies in Brazil.[2,3] Data from the CDC in the U.S,[15] a previous Brazilian study in São Paulo[3] and a Swiss systematic review[5] showed 79%, 71.8% and 69% female infected HCWs, respectively. An explanation for this fact is that the majority of HCWs, especially the ones working in nursing area, are female.

Recently published official data from Brazil showed that 44.5% of HCWs with confirmed SARS-CoV-2 infection worked in nursing.[2] This can be explained by the numerous opportunities for direct exposure to contaminated patients during the shift, which are generally greater than for other HCWs.

HCWs seems to have less severe illness and mortality than non-HCWs, perhaps related to younger age and fewer underlying illness.[12] The majority of our HCWs were young, with a median age of 34.4 years, which is also compatible with data from studies from the U.S,[15] Brazil[3] and the Swiss systematic review[5] that showed a median age of 41, 39 and 40 years, respectively.

In HCW-to-HCW exposure, all (100%, 10) the index cases were symptomatic at the time of exposure and 80% (8) had contact without wearing a face mask.

Although all HCWs have received training on the use of PPE, 70% had a high or medium risk of exposure and 80% of them were not wearing a N-95 respirator while performing aerosol generating procedures or had HCW-to-HCW contact without wearing a face mask. A few clusters were detected in our study contributing to the transmission of COVID-19.

At the beginning of the pandemic we had many professionals not using all the required PPE, especially during high viral load exposure procedures (endotracheal intubation, cardiopulmonary resuscitation, non-invasive ventilation, etc.). This was likely because at the start of the epidemic in our city the protocols for infection control were still being updated. In addition, there were many doubts regarding SARS-CoV-2 transmission especially concerning the aerosol route of transmission. The infected professionals could have easily spread the infection to others when they were not using PPE, such as during meal-breaks that took place in small and poor ventilated spaces.

Two Chinese studies evaluated risk factors for HCWs being contaminated. Ran et al. found that, among 72 HCWs in Wuhan, China, unqualified handwashing, suboptimal hand hygiene before patient contact, and inadequate PPE were risk factors for SARS-CoV-2 infection.[16] Wang et al. found out that the risk of COVID-19 in HCWs using medical masks was significantly higher when compared with those using N-95 respirators, even though this last group had a significantly higher exposure to infected patients.[17] After the results from these studies, our infection prevention and control team decided to adopt N-95 respirators as a standard PPE for all contacts with patients confirmed or suspected of COVID-19.

In our cohort of HCW with confirmed COVID-19, 9.6% (5/50) required hospitalization, 80% was discharges and one has died, with a lethality of 1.9%. The majority (98%) has fully recovered and this is also similar to CDC data, where 92% of patients were not hospitalized.[15] The Swiss review showed a pooled prevalence of 5% of severe disease in HCW, with an estimated lethality rate of 0.5%.[5]

Five out of 24 (20.8%) HCWs required hospitalization and from those, one has died. This HCW didn't have any known underlying health condition but developed sepsis and shock. The majority (95.8%) of patients recovered and were discharged. This is also similar to CDC data, where 92% of patients were not hospitalized.[15] The Swiss review showed a pooled prevalence of 5% severe disease cases in HCW, with an estimated lethality rate of 0.5%.[5]

The mortality rate among HCWs seems to be lower than that of the general population but since there is exposure to numerous infected individuals, HCWs, if infected, could be characterized by higher viral load, which is associated with worse clinical outcomes.[5]

Yombi et al. showed that fever might be a common symptom related to positivity of RT-PCR for SARS-CoV-2; but when this symptom was required as a criterion for testing, an important number of positive cases would bemissed in our case.[18]

Costa et al. evaluated the seroprevalence of SARS-CoV-2 and risk factors from 4,987 oligo/asymptomatic HCW in São Paulo, Brazil and found that the seroprevalence was 14% and associated factors were lower educational level (aOR of 1.93; 95% CI 1.03-3.6), using public transport to work (aOR of 1.65; 95% CI 1.07-2.62), and working in cleaning or security (aOR of 10.1; 95% CI 3.4-26.9).[19]

We must keep in mind that since the large number of asymptomatic HCWs with COVID-19 infection, universal screening for all exposed HCWs should be the standard strategy to reduce transmission of SARS-CoV-2 in a hospital setting, according to late CDC recommendation of testing after minimal five to seven days of exposure[5,20] Their absence from work can be a major challenge in a pandemic situation since the demands for patient care is very high and can overburden remaining co-workers on site. For this reason, CDC updated the previous recommendation of 14 days to return to work to 10 days for mild to moderate illness for those who are not severally immunocompromised.[21]

In our study, 2 cases (8.3%) probably originated from exposure in the community. Some studies suggest a relevant role of community transmission in the infection of HCWs.[22,13,14] However, in our study most of infections were due to hospital exposure, as the community prevalence was low.

Despite COVID-19 being a viral infection, it can sometimes lead to a bacterial infection as a complication. Our study indicated that a large number of patients (45.8%) who received antibiotic therapy. A study in Italy analyzed data from 731 hospitalized patients with SARS-CoV-2 infection and 9.3% of them were diagnosed with a secondary infection. The factors associated were low baseline lymphocyte count, baseline PaO_2/FiO_2 ratio and ICU admission in the first 48 hours since hospital admission.[23] A previous systematic review from Lans-

bury et al., found 7% of hospitalized COVID-19 patients with bacterial coinfections, which is less than in previous influenza pandemics and do not support the routine use of antibiotics in the management of COVID-19 infection.[24] This fact reinforces the need to create strategies to reduce this number of prescriptions by implementing antimicrobial stewardship in hospitals.

Our results should also be viewed through a conservative lens. Firtsly the small sample size. Also, we were unable to genotype SARS-CoV-2 samples to prove links between the exposed HCWs and index cases, although we used a rigorous case investigation and contact tracing methodology. Even though many studies have evaluated mental health impacts among HCWs, including depression, anxiety, psychological distress and sleep issues, we didn't evaluate these features on our study.[25]

Despite that, this study is one of the first in Brazil to describe in detail the risk levels of occupational exposures, adherence to PPE, the proportion of positive cases after extensive contact tracking, the detection of an intrahospital transmission cluster, in addition to describing clinical-epidemiological characteristics and outcomes from more than half of positive HCW.

CONCLUSION

The early detection of COVID-19 cases can be effective in containing hospital-related outbreaks. From what we have learned until now, guaranteeing access to PPE and training remain the best strategies to protect HCWs and those they serve. This study highlights how poor adherence to standard infection control recommendations can lead to in-hospital transmission during periods of staff shortages.

ACKNOWLEDGEMENTS

The authors would like to thank Alexander C. Lees and Nárgila G. Moura for the English review.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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