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Short communication

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The high prevalence of infectious diseases among health workers indicates the need for improving surveillance

Elevada prevalência de doenças infecciosas entre trabalhadores da saúde indica a necessidade de melhorar a vigilância

Abstract

Objective: to estimate the seroprevalence of arboviruses, syphilis, HIV, and hepatitis B (HBV) in Healthcare Workers (HCW). *Methods*: a survey among HCW among was randomly selected in a city in Bahia-Brazil. The research used a structured questionnaire, which collected sociodemographic, occupational, and health information in 2019. Rapid immunochromatographic tests were used to track infections. Thus, positive results for arboviruses, syphilis, HIV, and HBV indicated seropositivity for the respective infection. In addition, simultaneous detection of antibodies for zika (ZIKV) and dengue (DENV) viruses indicated seropositivity for flavivirus infection. *Results*: a total of 453 HCW were included, 82.8% were women. Most HCW (55.1%) reported contact with biological material; 5.2% reported injuries with biological material. The seroprevalence was 34.7% (95%CI:30.1-39.4) for dengue, 1.7% (95%CI:0.7-3.4) for zika, 9.9% (95%CI:7.2-13.2) for chikungunya, and 39.9% (95%CI:35.2-44.7) for flavivirus (ZIKV+DENV); with 21.9% (95%CI:18.1-26.2) being negative to all arboviruses. Seropositivity to arboviruses increased with age and was higher among endemic disease control agents. Three HCW tested positive for HBV (HBsAg); no HIV cases were detected. *Conclusion*: a high percentage of HCW was exposed to infectious agents (contact with biological material and/or exposure to arboviruses). Among the necessary conditions for preventing infections in the work environment, the following stand out: monitoring of infectious diseases among HCW, surveillance of work environments, and measures to control occupational exposures, such as the availability of repellents.

Keywords: communicable diseases; health workers; survey; occupational health; occupational health surveillance.

Resumo

Objetivo*: estimar soroprevalências de arboviroses, sífilis, HIV e Hepatite B (VHB) em trabalhadores de saúde (TS).* Métodos*: inquérito entre TS selecionados por amostragem aleatória, em uma cidade da Bahia – Brasil. Pesquisa realizada em 2019 por meio de questionário estruturado, que coletou informações sociodemográficas, ocupacionais e de saúde. Testes imunocromatográficos rápidos foram utilizados para rastrear as infecções, dessa forma resultados positivos para arboviroses, sífilis, HIV e VHB indicaram soropositividade para a respectiva infecção. Além disso, detecção simultânea de anticorpos para zika (ZIKV) e dengue (DENV) indicou soropositividade para infecção por flavivírus.* Resultados*: 453 TS foram incluídos, sendo 82,8% do sexo feminino. A maioria (55,1%) relatou contato com material biológico; 5,2% referiram acidentes com material biológico. Encontrou-se soroprevalência de 34,7% (IC95%:30,1-39,4) para dengue, 1,7% (IC95%:0,7-3,4) para zika, 9,9% (IC95%:7,2-13,2) para chikungunya e 39,9% (95%CI:35,2-44,7) para flavivírus (ZIKV+DENV); 21,9% (IC95%:18,1-26,2) foram negativos para todos os arbovírus. Soropositividade para arbovírus aumentou com a idade e foi maior entre agentes de combate a endemias. Três TS testaram positivo para VHB (HBsAg); nenhum para HIV.* Conclusão*: elevado percentual de TS estava exposto a agentes infecciosos (contato com material biológico e/ou exposição a arbovírus). Entre as condições necessárias à prevenção de infecções no ambiente de trabalho, destacam-se: monitoramento de infecções entre TS, vigilância dos ambientes laborais e medidas de controle de exposições ocupacionais, como disponibilidade de repelentes.*

Palavras-chave*: doenças infecciosas; trabalhador da saúde; inquérito; saúde do trabalhador; vigilância em saúde do trabalhador.*

Introduction

Infectious disease surveillance and monitoring represent significant challenges to healthcare systems worldwide. Biological hazards among healthcare workers (HCW) are not always visible in society and, often, are not adequately known by HCW themselves - this occurs mainly among workers who work in non-hospital contexts. The COVID-19 crisis has highlighted occupational risks in healthcare workplaces. The situations experienced during the COVID-19 pandemic demonstrated the remarkable susceptibility of some occupational groups, especially HCW[1], reinforcing the need for continuous monitoring of the health status of highly exposed populations.

The health protection of HCW, in general, does not reach the levels of prevention and biosafety required for safe work, particularly in developing countries, where precarious working conditions characterized by shortage of personnel, excessive working hours, and high exposure to occupational risks are present. Such hazards are often associated with a lack of protective equipment and with the experience of violence in the workplace[2].

The lack of effective protective measures and the high exposure to biological risks increase the infection rates among HCW. It is estimated that 40% of hepatitis B and C infections among HCW are likely due to occupational exposures[3]. HCW are also at a higher risk of tuberculosis and Ebola virus disease[4,5]. In 2003, during the severe acute respiratory syndrome (SARS) outbreak, almost half of the cases occurred among HCW in Canada[6]. In different health contexts, the data show the expressive vulnerability of HCW in their work environments: they frequently develop infections and illnesses. Deaths are also common due to high exposure to infectious agents associated with the absence and insufficiency of protection and prevention strategies. Considering the COVID-19 pandemic and the spread of infectious diseases (ID) among HCW, specific protective measures are urgent[2,4].

Among the measures for prevention and control of ID, those related to the work environment are crucial[7]. There is evidence that the prevention and control of ID among HCW positively impact both workers' health and patient safety[2]. Therefore, surveillance and monitoring of ID among HCW are essential to reveal the magnitude of the problem and can positively impact the health of workers and users of healthcare services.

Biological risk factors in healthcare settings are well recognized[8]. However, analyses of ID in the dynamics of these services and their relationship with accidents at work and absenteeism are scarce in Brazil[7]. Studies focusing on ID risk are important, especially in work environments that differ from hospital settings - traditionally the locus of most investigations.

Another aspect that deserves attention and reinforces the need for investigations and monitoring of ID in HCW is the low vaccination coverage observed in recent years among these workers in Brazil[8]. Inadequate coverage is associated with low-risk perception or exposure to these risks. It is also observed that workers outside the hospital settings, who do not provide direct care to patients, tend to have a reduced perception of exposure to biological risks[8]. In this way, including the approach and analysis of infectious diseases in all types of services and workplaces where HCW work can help give visibility to this problem and reinforce the need for attention and monitoring. This need was strongly evidenced in the context of the COVID-19 pandemic, as shown by the high incidence and mortality rates among HCW[9]. Although biological risks are not the same among all healthcare professionals, nor do they occur all the time, it is essential to emphasize that exposure to biological risks is experienced by all people who work in a healthcare facility and the risks are not limited to the pandemic situation, health crises, or specific work contexts.

This study investigates a group of infectious diseases through a survey and identifies those most frequent in this population. It aimed to estimate the seroprevalence of some arboviruses (dengue, Zika, and chikungunya), syphilis, HIV, and Hepatitis B (HBV) in health workers in a municipality in Bahia, Brazil, describing their distribution according to sociodemographic and occupational characteristics.

Methods

Study design

This is a survey with a sample of workers of the public healthcare network in a medium-sized municipality in Bahia, Brazil.

Setting

Participants recruiting and interviewing occurred at the HCW's workplace, from June to December 2019.

Participants

The survey included active workers in non-hospital public healthcare services located in urban and rural areas. The study population included workers in primary healthcare and

medium-complexity healthcare services, which include the Polyclinics, with specialized healthcare, Psychosocial Care Center, Worker's Health Reference Center, Testing and Counseling Center, Urgent and Emergency Care Services, Regulation Center, and Family Health Support Center.

Study Size

In calculating the sample size, the study adopted the following criteria: the total population of 622 HCW, outcome proportion equal to 50% (to maximize the sample size, since it estimates the highest possible N), error of 3%, and confidence level of 95%. The estimated sample was 394 HCW.

After calculating the sample size, the HCW were stratified by level of service complexity and occupational groups. The participation in the sample composition (number of people studied in each stratum) corresponded to the percentage participation of the groups in the target population. This strategy sought to ensure that groups with a smaller number were represented in the sample in a similar proportion to the total population. The stratified random sample was selected according to the following procedures: 1. Obtaining and organizing the list (provided by the Municipal Health Department) of all HCW according to the services and occupational group (strata of study interest); 2. Definition of the sample size and calculation of the percentage participation according to the established strata; 3. Selection, by a list of random numbers, of the HCW to be studied; 4. Contact with selected HCW and interviews conducted at the workplace. Sample substitution was performed, as needed, until the sample size established for each stratum was reached. The substitution list was organized after the original sample was drawn (also by random number list) and was limited to 20% of the total N sampled.

Bias

All interviews were conducted by trained researchers, who contacted the workers at their workplace. Aiming to reduce losses, three visits to the workplace were made on different days, shifts, and times. When the worker was not located or refused to participate, another worker with similar characteristics was invited to participate (same level of health service, occupational group, and sex of the previously selected person). With this substitution, the sample size established for each stratum was reached. The substitution list was organized after the original sample was drawn (also by random number list) and was limited to 20% of the total N sampled.

Measurement

The questionnaire was structured based on sociodemographic characteristics data from literature and self-reported exposure to potential sources of infection.

The collection of biological material for screening the diseases of interest was performed by trained nurses, following standardized technical and recommended ethical procedures. Rapid immunochromatographic tests evaluated dengue, zika, chikungunya, HIV, hepatitis B, and syphilis. The DPP® ZDC IgM/IgG rapid test (Biomanguinhos-Fiocruz) investigated arboviruses. The MedTest-HIV (MedLevensohn®) made the qualitative detection of anti-HIV antibodies 1 and 2; the Alere Determine™ Syphilis-TP kit (Abbott) analyzed syphilis, and the VIKIA HBsAg kit (BioMérieux) performed the detection of hepatitis B Surface Antigen (HBsAg).

A positive test result for a specific infection indicated seropositivity for that infection, independently of the results for the other diseases. The only exception was when an HCW was seropositive for both zika (ZIKV) and dengue (DENV). In this situation, considering the likelihood of cross-reactivity between tests since both ZIKV and DENV belong to the genus Flavivirus, the HCW was considered seropositive for flavivirus infection and not counted as dengue or zika infection separately. Consequently, regarding seropositivity for flaviviruses (ZIKV and DENV), the HCW was classified into three exclusive categories: positive for both viruses ("positive for flaviviruses"), positive for zika and negative for dengue ("positive for zika") or negative for zika and positive for dengue ("positive for dengue"). HCW showing negative results to the three arboviruses were classified as seronegative for all studied arboviruses. Conversely, HCW showing positive results for antibodies for both flavivirus and chikungunya (genus Alphavirus) were considered seropositive for all three arboviruses. Test results were delivered directly to the HCW participating in the study. Post-test counseling on Sexually Transmitted Infections and HIV/AIDS referrals were also provided.

Variables

The study evaluated sociodemographic characteristics such as age (21-30, 31-49, and 50 or more years), sex (men, women), skin color/ethnicity (Black, Mixed / Brown, White, and Yellow / Indigenous), and schooling (did not complete high school, completed high school, technical education, and university degree).

Occupations were grouped into six categories, considering the proximity to the job characteristics and occupational risk factors: community healthcare workers; endemic diseases control agents; healthcare providers (e.g., nurses, physicians, dentists, psychologists, social workers); administrative employees (e.g., coordinators, managers, receptionists, typists); health technicians (laboratory, nursing, and oral health technicians); and support services workers (e.g., general services personnel, security agents, kitchen assistants, drivers).

Other occupational aspects explored were type of job contract (civil servants or temporary job contract), type of healthcare services (primary healthcare services or medium-complexity healthcare services), and working time in current occupation (≤ 5, 6-10 or > 10 years)

Self-reported exposure to potential sources of infection were assessed by several variables such as contact with biological material (never, rarely, sometimes, or always), history of blood transfusion (yes/no), contact with body fluids from HIV or hepatitis patients (yes/no), use of injectable drugs (yes/no), number of sexual partners (<3 / 3 or more), handling of sharp instruments (yes/no), piercing (yes/no), and history of accident with biological materials (yes/no).

Data analysis

The sociodemographic and occupational characteristics of the study sample were described using percentages. Then, the prevalence of seropositivity to dengue, zika, and chikungunya were estimated with 95% confidence intervals (95%CI) and stratified by sociodemographic and occupational characteristics. All analyses were performed using the statistical package SPSS®22.0

Ethics

The study received approval from the Research Ethics Committee of the State University of Feira de Santana, Bahia, Brazil (CAAE:2.897062) in May 5, 2019. All participants signed an informed consent form.

Results

A total of 453 HCW participated in this study; however, 424 agreed to be tested for infectious diseases (response rate of 93.6%). The majority were women (82.8%), aged from 31 to 49 years (66.0%), without a complete university education (61.8%), Brown (50.5%) or Black (33.2%). Community healthcare workers (25.0%) and administrative employees (22.4%) were the most frequent occupations. Among the workers, 66.2% had a stable employment relationship, 76% worked in primary healthcare, and 38.1% were in the current occupation for more than ten years (**Table 1**).

Contact with biological materials during work was frequently reported (55.1%). Contact with blood and other body fluids from patients with HIV or hepatitis was described by 7.2%; 5.2% reported a history of occupational injuries with biological material; 49.2% reported handling sharp instruments. Higher percentages of HCW in primary healthcare reported contact with biological material sometimes/always (45.5% vs. 39.0% in medium complexity) and handling of sharp instruments (50.7% vs. 44.0%). However, reports of injuries with biological material were higher in the medium complexity services (6.7% vs. 4.8% in primary healthcare) (**Table 2**).

Besides, 6.7% said they had received a blood transfusion, 3.8% used some injectable drug, and 11.3% had three or more sexual partners (**Table 2**).

The global seroprevalence of the studied arboviruses was 34.7% (95%CI:30.1;39.4) for dengue, 1.7% (95%CI:0.7;3.4), for zika, 9.9% (95%CI:7.2;13.2), for chikungunya, and 39.9% (95%CI:35.2;44.7) for flavivirus (ZIKV+DENV). We identified no serological markers for infection with any of the three arboviruses in 21.9% (95%CI:18.1;26.2) (**Table 3**).

The presence of antibodies for any of the arbovirus increased with age and was higher among endemic disease control agents (85.2%). Dengue seroprevalence was higher among adults aged 50+ years (42.7%), White participants (50.0%), and health technicians (45.8%). Zika infection was higher among those aged from 21 to 30 years (4.9%), who did not complete high school (4.2%), and support services workers (10.0%). Chikungunya seroprevalence increased monotonically with age and prevail among endemic disease control agents (14.8%). One-third of the 21-30 years participants did not show serological markers for arboviruses infection (**Table 3**).

Table 1 Sociodemographic and occupational self-reported characteristics by healthcare workers (HCW) in a municipality of the State of Bahia. Brazil. 2019 (n=453)

Variables	*HCW*	
	*n**	*%*
Sex (n=453)		
Men	78	17.2
Women	375	82.8
Age group in years (n=442)		
21-30	44	10.0
31-49	292	66.0
50 or more	106	24.0
Ethnicity/Skin color (n=440)		
Black	146	33.2
Mixed / Brown	222	50.5
White	53	12.0
Yellow / Indigenous	19	4.3
Level of education (n=440)		
Did not complete high school	26	5.9
Completed high school	159	36.1
Technical education	87	19.8
University degree	168	38.2
Occupation (n=444)		
Community healthcare workers	111	25.0
Healthcare providers	76	17.1
Administrative employees	99	22.4
Endemic disease control agents	64	14.4
Health technicians	61	13.7
Support services workers	33	7.4
Type of job contract (n=453)		
Civil servants	300	66.2
Temporary job contract	153	33.8
Type of healthcare services (n=453)		
Primary healthcare services	344	76.0
Medium-complexity healthcare services	109	24.0
Working time in current occupation (n=438)		
≤ 5 years	120	27.4
6-10 years	151	34.5
> 10 years	167	38.1

*Different number of observations due to missing data.

Table 2 Exposure to potential sources of injuries with biological materials among healthcare workers (HCW) in a municipality of the State of Bahia. Brazil. 2019 (n=453)

Exposure	*HCW (Total=453)*		*Primary services (Total=352)*		*Medium complexity services (Total=101)*	
	n[*]	*%*	*n*	*%*	*n*	*%*
Contact with biological material (n=453)[*]						
Never	201	44.9	152	43.7	49	49.0
Rarely	53	11.8	41	11.8	12	12.0
Sometimes	92	20.5	79	22.7	13	13.0
Always	102	22.8	76	21.8	26	26.0
Blood transfusion (n=447)[*]						
Yes	30	6.7	24	6.9	6	5.9
No	417	93.3	322	93.1	95	94.1
Contact with body fluids from HIV or hepatitis patients (n=443)[*]						
Yes	32	7.2	26	7.6	6	6.1
No	411	92.8	318	92.4	93	93.9
Injectable drugs (n=447)[*]						
Yes	17	3.8	10	2.9	7	6.9
No	430	96.2	336	97.1	94	93.1
Three or more sexual partners (n=448)[*]						
Yes	52	11.6	38	11.0	14	13.9
No	396	88.4	309	89.0	87	86.1
Handling of sharp instruments (n=435)[*]						
Yes	214	49.2	170	50.7	44	44.0
No	221	50.8	165	49.3	56	56.0
Tattoo or Piercing (n=447)[*]						
Yes	75	16.8	55	15.9	20	19.8
No	372	83.2	291	84.1	81	80.2
Injuries with biological materials (n=422)[*]						
Yes[**]	22	5.2	16	4.8	6	6.7
No	399	94.8	315	95.2	84	93.3

HCW= Healthcare Workers.

[*] Different number of observations due to missing data.

[**] Workers who reported accidents with biological material (n=22) were: nursing staff (n=11), workers in the administrative sectors (n=7), health agents (n=3), and dentists (n=1). Among these, none showed positive serology for HIV, Syphilis, and Hepatitis B.

Table 3 Sociodemographic characteristics and seroprevalence to dengue, zika, and chikungunya among healthcare workers (HCW) in a municipality of the State of Bahia, Brazil, 2019 (n=424)

Variables	*Arbovirus*												
		Dengue (Dengue + / Zika -)		*Zika (Zika+/Dengue-)*		*Chikungunya*		*Flavivirus (Zika+/Dengue+)*		*Positive to the three arboviruses*		*Negative to all three arboviruses*	
	n	*%*	*95% CI*	*%*	*95% CI*	*%*	*95% CI*	*%*	*95% CI*	*%*	*95% CI*	*%*	*95% CI*
Global seroprevalence	424	34.7	30.1;39.4	1.7	0.7;3.4	9.9	7.2;13.2	39.9	35.2;44.7	78.1	73.8;81.9	21.9	18.1;26.2
Age group (years)													
21-30	41	24.4	12.4;40.3	4.9	0.6;16.5	7.3	1.5;19.9	34.1	20.1;50.6	65.9	49.4;79.9	34.1	20.0;50.6
31-49	273	33.3	27.8;39.3	1.1	0.2;3.2	9.9	6.6;14.1	39.9	34.1;46.0	76.9	71.5;81.8	23.1	18.2;28.5
50 or more	103	42.7	33.0;52.8	1.9	0.2;6.8	11.7	6.2;19.5	39.8	30.3;49.9	84.5	76.0;90.9	15.5	9.1;24.0
Sex													
Men	70	40.0	28.5;52.4	2.9	0.3;9.9	7.1	2.4;15.9	40.0	28.5;52.4	84.3	73.6;91,9	15.7	8.1;26.4
Women	354	33.6	28.7;38.8	1.4	0.5;3.3	10.5	7.5;14.1	39.8	34.7;45.1	76.8	72.1;81.1	23.2	18.9;27.9
Race/skin colour													
Black	140	30.0	22.6;38.3	0.7	0.0;3.9	13.6	8.4;20.4	42.3	34.5;51.5	75.7	67.8;82.6	24.3	17.4;32.2
Mixed/Brown	205	34.1	27.7;41.1	2.4	0.8;5.6	8.3	4.9;12.9	38.0	31.4;45.1	75.6	69.1;81.3	24.5	18.7;30.9
White	50	50.0	35.5;64.5	0.0	0.0;7.1	4.0	0.5;13.7	36.0	22.9;50.8	88.0	75.7;95.5	12.0	4.5;24.3
Yellow / Indigenous	17	47.1	22.9;72.1	0.0	0.0;19.5	17.6	3.8;43.4	47.1	22.9;72.1	100.0	80.5;100.0	0.0	0.0;19.5
Level of education													
Did not complete high school	24	37.5	18.8;59.4	4.2	0.1;21.1	12.5	2.7;32.4	33.3	15.6;55.3	75.0	53.3;90.2	25.0	9.8;46.7
Completed high school	151	34.4	26.9;42.6	1.3	0.2;4.7	13.2	8.3;19.7	42.4	34.4;50.7	80.8	73.6;86.7	19.2	13.3;26.4
Technical education	85	28.2	19.0;39.0	1.2	0.0;6.4	10.6	5.0;19.2	48.2	37.3;59.3	80.0	69.9;87.9	20.0	12.1;30.1
University degree	151	34.4	26.9;42.6	2.0	0.4;5.7	5.3	2.3;10.2	35.1	27.5;43.3	72.8	65.0;79.8	27.2	20.2;35.0
Occupation													
Community healthcare workers	109	31.2	22.7;40.8	0.0	0.0;3.3	11.0	5.8;18.4	44.0	34.5;53.9	78.9	70.0;86.1	21.1	13.9;30.0
Endemic disease control agents	61	36.1	24.2;49.4	1.6	0.0;8.8	14.8	7.0;26.2	44.3	31.5;57.6	85.2	73.8;93.0	14.8	7.0;26.2
Administrative employees	89	37.1	27.1;48.0	1.1	0.0;6.1	12.4	6.3;21.0	36.0	26.1;46.8	75.2	65.0;83.8	24.8	16.2;35.0
Health technicians	59	45.8	32.7;59.2	1.7	0.0;9.1	10.2	3.8;20.8	33.9	22.1;47.4	83.1	71.0;91.6	16.9	8.4;29.0
Healthcare providers	69	27.5	17.5;39.6	1.4	0.0;7.8	1.4	0.0;7.8	42.0	30.2;54.5	71.0	58.8;81.3	29.0	18.7;41.2
Support services workers	30	36.7	19.9;56.1	10.0	2.1;26.5	10.0	2.1;26.5	30.0	14.7;49.4	76.7	57.7;90.1	23.3	9.9;42.3

Among participants, three HCW tested positive for HBsAg (HBV: 0.7%); only one was aware of his serological status. No cases of HIV were detected. Of the four positive cases of syphilis (0.7%), the later laboratory test to investigate venereal diseases confirmed positivity for two and ruled out the other two. The research team communicated their health condition to the infected workers and referred them for treatment and follow-up at the municipal reference services for infectious diseases. Professionals at these services took over the notification, treatment, and monitoring of workers seropositive for syphilis and hepatitis B.

Discussion

This study identified a high seroprevalence of arboviruses among HCW, especially dengue and flavivirus infections (DENV+ZIKV), and a high frequency of exposure to potential biological sources of infection. Health workplaces present a wide range of exposures, both indoors and outdoors, that are generally higher than in other work contexts[10].

Few seroprevalence studies on arbovirus in Brazil exist, none among HCW[11,12]. A survey in the city of Rio de Janeiro, using the same arbovirus tests as in our study, estimated the flavivirus (DENV+ZIKV), chikungunya, and zika seroprevalence as 48.6%, 18.0%, and 3.2%, respectively, higher than ours (39.9%, 9.9%, and 1.7%, correspondingly)[10]. In that study, seroprevalence for dengue was 28.9%, lower than the 34.7% detected in our study; 17.0% had no contact with any of the three arboviruses comparing to 21.9% here[11]. A population study in the city of Juazeiro do Norte, Ceará State, using ELISA for antibody detection, estimated the seroprevalence of dengue, zika, and chikungunya as 37.9%, 0.74%, and 25.5%, respectively[12]. It is not easy to compare our results with studies conducted in different settings with distinct historical backgrounds of arbovirus circulation, sociodemographic profiles, environmental conditions, and target populations. However, it is worth noting that seroprevalences for arboviruses were markedly high in all studies, reflecting the failure of control programs against the vector *Aedes aegypti* in Brazil[13].

Our results showed a higher occurrence of arboviruses among healthcare agents. As they live in the community where they work, it is questioned whether the environmental risk may be similar to that of the general population, not related to workplace. Although the health agents reside in the territory where they work, it is important to point out that the constant displacement in the territory, the home visits, often in areas with high levels of vector circulation and infected people, can increase the time and variety of environmental exposure and, consequently, the risk of infection. Thus, even if exposed to the general risk conditions of populations, it is likely that mandatory and daily occupational exposure increases the risk of infection. It is always a challenge for field health workers to separate the portion of exclusive exposure due to work. In such cases, the precautionary principle is helpful: if the work may increase the risk, it is recommended that preventive measures be adopted.

The work environment is not the only source of infection for healthcare workers. Other situations can also contribute to the infection, such as contact with infected people at home or social gatherings, blood transfusions, and injecting drug use. However, the risk of infection increases when occupational risk factors are further added, underscoring the importance of surveillance of infectious diseases among HCW. The professional activity is conducted during a significant period of a lifetime[10]; thus, exposure to biological and environmental risks becomes a relevant source of infection. Surveillance gaps in the work context contribute to the invisibility of occupational risks, increasing vulnerability to infection[14].

A remarkable point refers to the misleading conceptions of potential sources of infection among HCW. Traditionally, the risk of infection among HCW is associated with the direct care for infected patients or manipulating biological material. Our results showed that occupational categories that are generally considered as low-risk were highly affected by arboviruses. As expected, the prevalence of arbovirus infection was higher among health technicians, usually working in labs. However, the arbovirus prevalence was also high among community healthcare workers and endemic disease control agents. The activities developed by these last two professional groups, mainly in external environments, exposed them to the breeding sites of *Aedes aegypti*, increasing the risk for arbovirus infections[15]. These workers are often insufficiently trained to self-protect against arboviruses[16]. Poor working conditions and lack of access to preventive measures, such as repellents, may also increase the risk of infection.

In Brazil, data on infectious diseases among HCW are scarce. Although, the National List of Work-Related Diseases includes these diseases, and a system to register one's occupation exists in the Brazilian Health Information System of Notifiable Diseases (SINAN), data are often not completed. The disease's relationship with work is seldom registered. Therefore, the difficulties in recording work-related illnesses lead to underestimation of their burden.

This study highlights the relevance of worker's health surveillance actions with a focus on infectious diseases.

Considering the high exposure of HCW to occupational risks, ensuring access to prevention, counseling, and testing for infectious diseases using low-cost techniques are powerful prevention strategies[17]. Our study identified infected HCW who were not aware of their condition. This situation represents a risk for the development of more severe clinical conditions of the diseases and can promote the spread of infections across both workplaces and communities.

In interpreting the results of this study, some limitations may be considered. One of them is the specificity of the sample, HCW from a medium-sized municipality, which may limit its generalizability. However, it is unlikely that the study setting differs substantially from other primary and medium complexity healthcare services in most cities of this size, at least in the northeast region of Brazil. Survey studies offer a good dimension of the health situation, inform preventive actions, and provide baseline data for evaluating the impact of interventions. Bearing in mind these limitations, as one of the first studies in Brazil investigating the prevalence of infectious diseases among HCW, it might foster future longitudinal and geographically comprehensive investigations.

Considering the relevance of infectious diseases surveillance services for health management, future efforts should be directed towards implementing and incorporating information systems (from cases and exposures) into the flow of services; developing of continuing education programs for capacity-building in the management and prevention of infectious diseases; and monitoring of occupational and environmental risks in services and in workplaces. The emergence and reemergence of infectious diseases evidence the demand for research and intervention in this field.

Primary and medium complexity healthcare services should incorporate surveillance and monitoring of infectious diseases among HCW. Implementing health surveillance and monitoring system for healthcare workers, including testing these workers, is a strategic measure for prevention, protection, and health promotion programs, contributing to greater effectiveness of preventive interventions. Concrete actions in this direction are urgent: continuous surveillance actions allow us to know the reality of workers in each context, identify the determining factors of health problems, and establish interventions on these factors to modify the general health condition[18]. The scope of these actions may include measures to control occupational exposures, availability of repellents, and personal protective equipment; combating environmental and sanitary conditions that favor the proliferation of mosquitoes; and installing screens on windows at work and home, for example, are measures to prevent infections in the workplace[19] and its surroundings. However, it should also include actions to redesign the work processes and ways of conducting the work, preserving and protecting the lives and health of workers.

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Authors' contributions:

Araújo TM, Souza FO, and Pinho PS contributed to study design. Souza FO, Helioterio MC, and Pinho PS contributed to data collection. All authors contributed to the analysis and data discussion, critical revisions of the manuscript, approval of the final version, and assume full responsibility for the work performed and published content.

Data availability:

All authors declare that the dataset that supports this study is not publicly available because it comes from individual interviews and contains information that allows identifying people or workplaces, even with anonymization.

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