

Work accidents with exposure to biological material in physiotherapists according to formal and informal employment bonds

Acidentes de trabalho com exposição a material biológico em fisioterapeutas segundo vínculo formal e informal

Janaina Oliveira de Souza¹ Milena Maria Cordeiro de Almeida² ¹Corresponding author. Universidade Federal da Bahia (Salvador). Bahia, Brazil. janainaodes@gmail.com²Universidade Federal da Bahia (Salvador). Bahia, Brazil. milena.cordeiro@ufba.br

ABSTRACT | INTRODUCTION: Health workers, including physiotherapists, are at greater risk of occupational injuries involving exposure to biological material (OI-bio), when compared to others. **OBJECTIVE:** To describe the epidemiological profile of OI-bio in physiotherapists, according to their work contracts (formal/informal). **METHODS:** A case study of work-related notifications by biological material in physiotherapists, registered in the Information System for Notifiable Diseases, Brazil, from 2008 to 2018. **RESULTS:** There were 2,565 OI-bio records in physiotherapists, with an increase in notifications (169.2%) in the period. The majority among those with formal contracts (68.3%). Among formals, the majority were female (82.7%), aged between 30 and 39 years (46.8%) and white people (69.6%). Among the informal, the majority were also female (85.3%), younger, 18 to 29 years old (62.2%) and white people (69.8%). In both groups, the specific occupation was general physiotherapist, cases evolving to discharge from a negative patient/source. Formals had 1 to 6 years of occupational experience (44.8%) and record of Communication of Occupational Injury (COI) in 58.1% of cases. Among the informal, the work experience time was less than 1 year (47.7%) and only 28.6% had COI registration. The use of Personal Protective Equipment (PPE) had little difference between groups, with gloves, aprons and masks being the most used. **CONCLUSION:** Although OI-bio are more reported in physiotherapists with formal contract, among informal ones they occur in younger people, with less experience and without COI registration, in addition to worse information registration and abandonment of developments, indicating greater vulnerability, especially in relation to social protection measures.

KEYWORDS: Occupational injuries. Biohazard release. Physical Therapists. Occupational groups.

RESUMO | INTRODUÇÃO: Trabalhadores de saúde, incluindo fisioterapeutas, estão sob maior risco de acidentes de trabalho com exposição à material biológico (At-bio), quando comparados a outros. **OBJETIVO:** Descrever perfil epidemiológico dos At-bio em fisioterapeutas, segundo vínculo de trabalho. **MÉTODOS:** Estudo de casuística das notificações de At-bio em fisioterapeutas registradas no Sistema de Informação de Agravos de Notificação, Brasil, 2008 a 2018. **RESULTADOS:** Foram 2.565 registros At-bio em fisioterapeutas, com crescimento de notificações (169,2%) no período, maioria entre os de vínculo formal (68,3%). Entre formais, a maioria foi do sexo feminino (82,7%), com idade entre 30 a 39 anos (46,8%) e raça/cor branca (69,6%). Entre informais, a maioria também foi feminina (85,3%), mais jovens, de 18 a 29 anos (62,2%) e raça/cor branca (69,8%). Em ambos os grupos, a ocupação específica foi fisioterapeuta geral, com casos evoluindo para alta paciente fonte negativa. Os formais tinham 1 a 6 anos de experiência ocupacional (44,8%) e registro de Comunicação do Acidente de Trabalho (CAT) em 58,1% dos casos. Nos informais, o tempo de experiência era menor que 1 ano (47,7%) e apenas 28,6% tiveram o registro da CAT. O uso dos Equipamentos de Proteção Individual (EPI) teve pequena diferença entre grupos, sendo luva, avental e máscaras os mais utilizados. **CONCLUSÃO:** Embora os At-bio sejam mais notificados em fisioterapeutas com vínculo formal, entre informais acontecem em mais jovens, com menor tempo de experiência e sem registro da CAT, além de pior registro de informações e abandono de evoluções, indicando maior vulnerabilidade, especialmente em relação às medidas de proteção social.

PALAVRAS-CHAVE: Acidentes de trabalho. Acidentes biológicos. Fisioterapeutas. Categorias de trabalhadores.

Introduction

Occupational injuries with exposure to biological material (OI-bio) occur more frequently among health workers due to the specific characteristics of procedures that are performed in health care and the conditions in which the work is performed¹. OI-bio are events that happen with direct or indirect exposure of the worker to biological material (organic, human or animal fluids potentially infectious such as: sputum, sweat, tear, urine, vomiting, feces, nasal discharge, saliva, sexual secretions, and cerebrospinal, peritoneal, pleural, synovial, pericardial and amniotic fluids)¹.

Investigations about OI-bio among health professionals showed that those who care for users of health services by having direct contact with them are the most exposed². Although some of the studies found related that the most affected health professionals are nurses, doctors, dentists and nursing technicians; physiotherapists are also part of the health professionals category affected by OI-bio^{1,2}.

Physiotherapists may be exposed to biological and physical risks such as electromagnetic radiation, ergonomic risks and injuries depending on their work environment and work processes. Many of these risks are shared among all health professionals³. Especially professionals who are part of teams in Intensive Care Units or in hospital environments involved in activities such as patient mobilization, respiratory maneuvers and pulmonary reexpansion are constantly exposed to injuries with biological material⁴. Recently, because of the COVID-19 pandemic, the discussion on the need for biosafety among health professionals, including physical therapists engaged in different levels of care, such as Primary Health Care, has been intensified⁵.

According to Decree No. 777/GM, of April 28, 2004, in article 1, paragraph 1, OI-bio is one of the conditions of compulsory notification and must be registered in a specific investigation form of the Notifiable Diseases Information System (SINAN)⁶. The confirmation of this injury can be made by any health professional. SINAN is an information system that provides important information for epidemiological surveillance, which aims to help to control diseases and to support decision-making in the three spheres of government (municipal, state and federal)⁶. For the field of Occupational Health, SINAN is one of the sources of information for workers health surveillance (WHS) that is used for research and intervention regarding the work process and the

health of professionals considering the associated diseases and determinants⁷.

Data on work-related injuries are under-reported, therefore it compromises epidemiological studies and, consequently, WHS^{8,9}. However, the institution of mandatory registration of work-related injuries represents an achievement for the field of Workers Health because notifications and investigations of occupational injuries are among the main requirements for WHS's actions. Then, actions of promoting protection and attention to health of works are made possible⁹.

Therefore, knowing the profile of OI-bio in Brazil is relevant because it permits to understand the factors related to their occurrence, to identify the most vulnerable groups, and to collaborate for the creation of interventions to prevent injuries. Based on this rationale, this study aims to describe the epidemiological profile of occupational injuries with exposure to biological material (OI-bio) in physical therapists according to their employment bonds.

Methods

A case study of OI-bio notifications in physical therapists registered with secondary data from Occupational injuries with Exposure to Biological Material (OI-bio) registered in the Notifiable Diseases Information System (SINAN) in Brazil from 2008 to 2018.

Data prior to 2008 was not used due to the small number of records, which suggests a high number of under-reported cases. It is worth mentioning that the notification of OI-bio cases became mandatory in 2004, with the Decree No. 777/GM. However, the records available in the database started in 2006. The SINAN data are publicly accessible on the DATASUS and they are available on the website of the Collaborating Center for Surveillance of Workers Health Diseases (CCVISAT/UFBA, 2019)¹⁰.

SINAN uses the Occupational Injury with Exposure to Biological Material investigation form. Based on the data generated by this instrument, registered in the SINAN database, notifications regarding the occupation of physical therapists were analyzed according to the Brazilian Classification of Occupations (CBO) of the Ministry of Labor (CBO 4 digits = 2236).

Records were analyzed and described according to the employment bonds (original situation in the labor market in the SINAN notification form). Then, records were categorized into two groups: formal (including workers with a formal contract, workers that work for the government and employers); and informal (including self-employed, temporary employed, cooperative employed and unregistered employed). In addition, to avoid possible registration errors, all cases should be referent to professionals at least 18 years old and with a complete college education.

The variables of interest were extracted following the logic of the SINAN notification form, namely: time (year of notifications, 2008 to 2018); sociodemographic, gender (female and male), age according to age groups (18 to 29 years old, 30 to 39 years old, 40 to 49 years old, 50 to 59 years old and 60 years old or more), race/color (white, black or brown, and others); occupational and injury evolution, specific occupation (according to the Brazilian Classification of Occupations - general physiotherapist, respiratory, trauma-orthopedics, acupuncturist and occupational physiotherapist), time in the occupation (less than 1 year, 1 to 6 years, 7 years or more), report of occupational injuries- RWA (yes, no, not applicable and ignored); and evolution (discharge with serological conversion, discharge without serological conversion, discharge from a negative source, abandonment, death from another cause and ignored); and use of Personal Protective Equipment such as glove, apron, glasses, face protection and mask (yes, no). The variables of interest were analyzed from simple and relative frequencies and presented through graphs and tables. The analysis was performed with the SAS 9.4 program. The Excel 2010 program was used to tabulate and organize the data.

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Results

2,565 OI-bio were registered at SINAN in physiotherapists in Brazil from 2008 to 2018, which represents 1.31% of the total notifications of OI-bio

among those older than 18 years of age and with complete college education. It was observed that OI-bio notifications among physiotherapists were mostly among professionals with formal work bonds (70.5%). There was a positive variation in the number of OI-bio notifications for the total of physical therapists (169.2%), with a higher increase among physical therapists with a formal employment bond (246.9%) when compared to the ones with an informal employment bond (75.5%) (Figure 1).

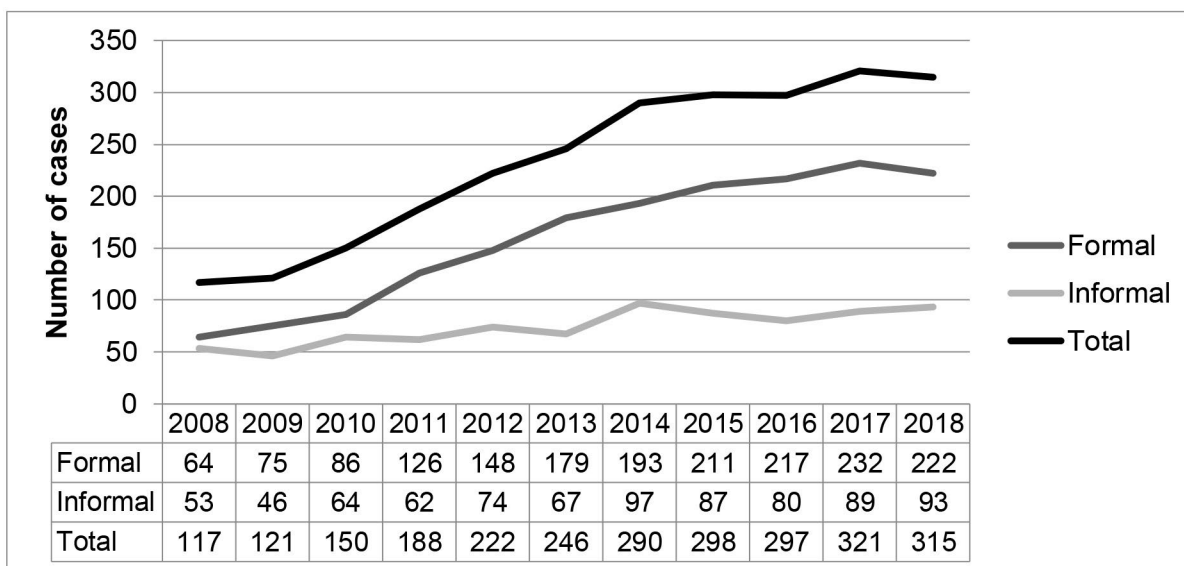
In the records among physical therapists with a formal employment bond, the majority were female (82.7%), aged between 30 and 39 years (46.8%) and self-declared skin color white (69.6%). Among the ones with an informal employment bond, the majority were also female (85.3%), aged between 18 and 29 years (62.2%) and self-declared skin color white (69.8%) (Table 1).

Regarding the occupational characteristics of injuries, physiotherapists with formal employment bonds had the specific occupation of general physiotherapist (97.1%) with 1 to 6 years of occupational experience (44.8%). Most of them have had a record of Communication of Occupational Injury (58.1%) although 27.2% have had the record of this information ignored and had an evolution to patient discharge due to negative results regarding the source of contamination (37.4%).

In the informal sector, the majority also have records in the specific occupation of general physiotherapist (98.5%), but with less than 1 year of occupational experience (47.7%). Here, only 28.6% of them have had the record of the Communication of Occupational Injury and 36.7% were ignored and had an evolution to patient discharge due to negative results regarding the source of contamination (30.4%). Worst patient evolutions such as abandonment (13.6%) and discharge with serological conversion (0.5%) were also recorded among the professionals with informal employment bonds (Table 2).

Regarding the use of Personal Protective Equipment (PPE's) (Figure 2), gloves, overalls and masks were reported by most physiotherapists with small differences in relation to the employment bond. The use of facial protection and glasses were mentioned by the minority of professionals who were most commonly physiotherapists with formal employment bonds.

Figure 1. Evolution of the distribution of injuries with exposure to biological material in physiotherapists, according to the employment bond*, Brazil, 2008 to 2018



*354 cases were excluded without registering of employment bond.

Source: SINAN - CCVISAT/UFBA, 2008 - 2018

Table 1. Sociodemographic characteristics of injuries with exposure to biological material in physiotherapists, according to employment bond *, Brazil, 2008 to 2018

	Formal worker N=1753		Informal worker N=812		Total N=2565	
		100%		100%		100%
Gender						
Female	1450	82.7	693	85.3	2143	83.6
Male	303	17.3	119	14.7	422	16.5
Age Group						
18 a 29	745	42.5	505	62.2	1250	48.7
30 a 39	820	46.8	255	31.4	1075	41.9
40 a 49	149	8.5	38	4.7	187	7.3
50 a 59	37	2.1	12	1.6	49	1.9
>60	2	0.1	2	0.3	4	0.2
Skin color						
White	1220	69.6	567	69.8	1787	69.7
Black/brown	364	20.8	165	20.3	529	20.6
Others	169	9.6	80	9.8	249	9.7

*354 cases were excluded without registering of employment bond.

Source: SINAN - CCVISAT/UFBA, 2008 - 2018

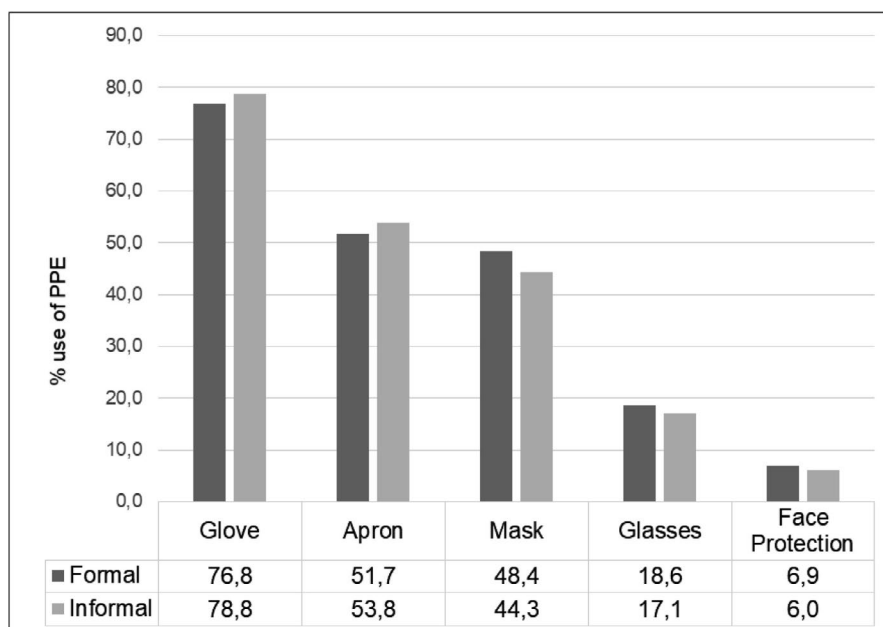
Table 2. Occupational characteristics of injuries with exposure to biological material in physical therapists, according to employment bond *, Brazil, 2008 to 2018

	Formal worker		Informal worker		Total	
	N=1753	100%	N=812	100%	N=2565	100%
Specific occupation						
General physiotherapist	1702	97.1	800	98.5	2502	97.5
Respiratory physiotherapist	46	2.6	11	1.4	57	2.2
Occupational physiotherapist	3	0.2	0	3.0	3	0.1
Trauma-orthopedics physiotherapist	1	0.1	0	0.0	1	0.1
Acupuncturist physiotherapist	1	0.1	1	0.1	2	0.1
Occupation time						
<1 year	641	36.6	387	47.7	1028	40.0
1 to 6 years	785	44.8	343	42.2	1128	44.0
≥7 years	327	18.7	82	10.1	409	16.0
Communication of Occupational Injury (COI)						
Yes	1018	58.1	232	28.6	1250	48.7
No	196	11.2	172	21.2	368	14.4
Not applicable	63	3.6	110	13.6	173	6.7
Ignored	476	27.2	298	36.7	774	30.2
Prognosis						
Discharge with serological conversion	6	0.3	4	0.5	10	0.4
Discharge without serological conversion	336	19.2	142	17.5	478	18.6
Discharge from a negative patient/source	656	37.4	247	30.4	903	35.2
Abandonment	147	8.4	110	13.6	257	10.0
Death for another cause	1	0.1	1	0.1	2	0.1
Ignored	607	34.6	308	37.9	915	35.7

*354 cases were excluded without registering of employment bond.

Source: SINAN - CCVISAT/UFBA, 2008 - 2018

Figure 2. Percentage distribution of the use of personal protective equipment (PPE) in cases of injuries with exposure to biological material in physical therapists, according to employment bond *, Brazil, 2008 to 2018



*354 cases were excluded without registering of employment bond or PPE use.

Source: SINAN - CCVISAT/UFBA, 2008 - 2018

Discussion

Physiotherapists are part of the group of health professionals under the risk of suffering occupational injuries with exposure to biological material that have been showing increased numbers of records over time. Although physiotherapists with formal employment bonds still have greater visibility in the number of notifications, the ones with informal employment bonds seem to be in a greater condition of vulnerability regarding the evolution of injuries and social protection. In addition, the physiotherapists with informal employment bonds are younger, therefore, with less professional experience.

The increase in the number of OI-bio over time can be justified by the greater attention given to the notification of these injuries, by the knowledge about the legislation and by the legal duty that the employers have to notify these injuries⁹. It is worth mentioning that SINAN seems to give privilege to the formal worker since injuries that occur in this group end up being more registered than those with professionals who have informal employment bonds. Therefore, demonstrating that formal workers have a better support while showing the vulnerability of informal workers^{1,11}.

It can be assumed that OI-bio is a condition that is still largely underreported for multiple reasons such as ignorance of the risks and procedures to be performed after exposure to biological material (infectious agent), judgments related to low risk character of some injuries, and deficiency in recognizing the causality between work and illness by managers/workers¹². The scarcity of time resulting from the excessive workload, the fear of getting fired, and/or the feeling of being guilty in relation to the occurrence of the injury can also be factors that directly leads to underreporting¹³ in addition to the excessive bureaucracy of the reporting process¹⁴.

OI-bio generally occur in the work environment when the health worker or other categories (firefighters, police, garbage collectors, janitors, ambulance drivers and others)^{15,16} have direct contact with organic materials through percutaneous, mucosal and non-healthy skin in the performance or not of some activity. Through this direct contact these workers can be exposed to transmissible pathogens such

as Hepatitis B Virus (HBV), Hepatitis C Virus (HCV) and Human Immunodeficiency Virus (HIV)¹⁷. These injuries are worrisome factors because they result in losses not only for the institutions but also to the workers themselves¹⁸.

Preventive measures such as updating the vaccination situation (including complete vaccine regimens, for example: vaccine against Hepatitis B), and keeping campaigns and guidelines in the services constantly are important to alert and keep health professionals informed¹⁹⁻²¹. Professionals also need to be informed that post-exposure prophylactic measures may not be fully effective since several factors can interfere with their success such as time, type of biological material source of contamination, among others¹. Therefore, the organization of the work process, vaccination, availability and use of Personal Protective Equipment are still important preventive measures.

Formal workers and people that work for the government also showed a prevalent number of OI-bio notifications in a previous study that used SINAN data and considered all health professionals in Brazil until 2014. Such results support the outcomes of vulnerability/limitation of records involving informal workers¹¹ beyond the physical therapy occupation. This same study also showed greater incidence of OI-bio in workers with an occupation time of up to 5 years, which corroborates with the data presented herein. Taking into consideration that there was a greater number of injuries among formal workers, a higher notification of OI-bio emission was also expected¹.

Regarding the employment bond of workers, in general, working conditions in the informal sector present numerous risk factors for health. Moreover, the informal condition shows a lack of basic measurements of protection (such as access and use of PPE and a controlled environment), deprivation of legal protection ensured by the informalization of the employment contract, non-compliance with basic safety rules, lack of supervision, and lack of social insurance coverage for injuries at work²². Additionally, the pressure experienced by these workers in the face of the need for survival, which makes them leave in the background all other demands for life and work; and the lack of knowledge about basic rights and mechanisms for legal protection of citizenship reaffirms the vulnerability and deprotection of this group²².

The predominance of OI-bio in female health professionals, self-declared white, aged 18 to 39 years, was also observed in previous studies^{1,19,20,23}. Such results show that there is a prevalence of the workforce of women in the health area. However, the illness of female health professionals is not just because they represent the majority, but also because of several other factors such as low salaries, excessive workload and the set of other activities that are typically performed by women¹².

No previous studies were found in the literature that specifically addressed physical therapists. However, these professionals are part of the health team and have direct contact with users of this service. Therefore, they are exposed and susceptible to the risks of OI-bio. Studies indicate that it is not only nurses who have problems with the handling of infectious materials (despite being the most affected professional category), but also all health professionals who are directly responsible for patient care. Indeed, it is known that physical therapists, in the hospital environment, may have contact with these materials/substances during the patients care procedures^{2,16}.

The use of PPE is indispensable for health workers because they may protect them from exposure to biological material in the event of injuries. The non-use of PPE in work activities generates direct contact with biological material and increases the risk of contamination and illness among workers^{1,11,12}. Training and permanent education of professionals is essential so that work activities are carried out more safely¹⁷ and must be guaranteed by employers. Every worker must also assume the responsibility to use and properly dispose of the Personal Protection Equipment (PPE) and Collective Protection Equipment (CPE), keep the vaccination situation up to date and adequate post-occupational exposure conduct to guarantee their own protection and the protection of co-workers and health service users¹⁷.

According to the Manual of General Guidelines for Work in Containment with Biological Agents prepared by the Health Biosafety Commission (HBC) of the Ministry of Health of Brazil, the use of PPE and CPE and immunization are part of primary containment process to protect professionals, users of the health

system, the general population and the environment of agents that are potentially dangerous²⁴. Therefore, the mandatory use of PPE and CPE and the procedures for disposing potentially infected materials require periodic training for such professionals to promote better safety and knowledge about the use of these apparatus. Consequently, these actions can help to reduce the exposure of health workers to blood and/or body fluids while handling or providing care to users of the health system²⁵.

This study has limitations, especially regarding the underreporting of some variables such as the evolution of cases, which is an important challenge and repeatedly reported by other surveillance studies^{17,25}. In view of these limitations, there is a concern regarding the information about health care workers. The necessity for permanent training of professionals who work in filling out notices, investigating, and issuing the communication of occupational injuries can be highlighted as a matter to be improved to promote a better performance of worker health surveillance¹⁷.

There are only a few studies in the literature that address occupational health with an emphasis on Occupational injuries with Exposure to Biological Material (OI-bio). Moreover, there were neither studies that had physiotherapists as their main focus, nor studies that reported employment bonds (formal and informal) and injuries for that occupation. Therefore, this study significantly contributes to the literature and to expand the knowledge on this topic. Accordingly, this study corroborates to raise the interest for further research of public measures and policies that aim the care and the safety of the work environment for health professionals including physiotherapists and the specifics of their work processes and employment bonds.

Conclusion

OI-bio are more reported in physical therapists with formal employment bonds and some characteristics of these injuries point to greater vulnerability among the ones with informal employment bonds. OI-bio among the physical therapists with informal employment

bonds affect younger physiotherapists with less experience and evolution without Communication of Occupational Injury registration. Furthermore, for physical therapists with informal employment bonds, the record of information and the lack of information about the patient evolution is worse than for the ones with formal employment bonds.

Although physiotherapists are a risk group for OI-bio, just little information is known about their profile. This can directly lead to the risk naturalization and the loss of prevention opportunities. Therefore, there is a necessity for further studies and specific prevention measures such as providing better health surveillance, especially for informal workers, and considering the specifics of the occupation. It is also noteworthy that informal professionals seem to be under greater vulnerability especially in relation to social protection measures.

It is worth highlighting the importance of keeping physiotherapists and other health professionals adequately informed about the responsibility and importance of communicating the occurrence of OI-bio between professionals and health care users. Moreover, they should be aware of their rights, such as adequate training and access to PPE, which must be provided by employers. Finally, it is expected that the present study can contribute for the dissemination of information both for physiotherapists and other health professionals, as well as for institutions, and that, therefore, a new approach can be established on the importance of notifications and the effects of these in worker health surveillance.

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Author contributions

Souza JO participated in the design, analysis, discussion of data and in the writing of the manuscript. Almeida MMC followed the design and analysis of the data guiding adjustments and corrections of

the tables, the graphs and the final manuscript for submission.

Competing interests

No financial, legal or political conflicts of interest with third parties (government, companies and private foundations, etc.) were declared for any aspect of the submitted work (including but not limited to grants, data monitoring board, study design, manuscript preparation, statistical analysis, etc.).

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