DOI: 10.1590/1413-812320232810.10072023EN

Work conditions and biosafety of health professionals and invisible health workers in the context of COVID-19 in Brazil

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Abstract *The present article addresses the work conditions in health in the context of the COVID-19 pandemic in Brazil. This is a cross-sectional study that used data from the surveys "Working conditions of healthcare professionals in the context of Covid-19 in Brazil" and "Invisible healthcare workers: work conditions and mental health in the context of Covid-19 in Brazil", seeking to better understand the working conditions and biosafety of these two distinct and socially unequal professional contingents. Data analysis proves that work conditions were extremely affected due to inadequate infrastructures, strenuous work, biosecurity at risk, exhaustion, fear of contamination and death, strong signs of physical and mental exhaustion, among workers. It also points out the discrimination and inequalities of social rights and professional development that mark the worlds of work highlighted in the surveys, emphasizing the profound inequalities that exist in Brazil and in its regions. It concludes by showing the importance of formulating public policies within the scope of work management in SUS, which ensures the protection, appreciation and reduction of inequalities pointed out in this article.*

Key words *Invisible Healthcare Workers, Healthcare Professionals, Work Conditions; Biosafety, COVID-19 in Brazil*

Introduction

The COVID-19 pandemic constituted a systemic threat to human life, that was unprecedented and moved beyond borders. It must be considered and treated as a health crisis, as well as a humanitarian and economic crisis. The pandemic exacerbated social inequalities worldwide. In Brazil, over the last two and a half years, such inequalities have reached unbearable proportions, aggravating the situation of vulnerable segments of the population that have no social protection.

The association between economic crisis and the pandemic of coronavirus "generated impacts and profound consequences for humanity, who depend upon their work to survive. Beyond the extremely high global death rates, there was also an enormous expansion of impoverishment and misery throughout the working class"[1].

Antunes[1] mentions that, in 2019, more than 40% of the working class was employed in the informal sector. The phenomenon of uberization "was already a reality for more than 5 million workers, by means of applications and digital platforms". By contrast, there was also unemployment and a "growing underemployed, outsourced, intermittent and precarious mass of workers in practically all work spaces".

The problem was compounded by an overload of labor, understaffing in health staff without proper qualification to embrace and deal with COVID-19 cases, the exposure of risk groups, the need for permanent training, unhealthy workplaces, exhaustion, and fear of becoming sick or dying in an environment with serious fragility in terms of biosafety actions[2].

Fiocruz conducted studies which showed the reality of health workers (HW) who were in the frontlines in the fight against COVID-19, and the results of those studies proved that they endured pain, suffering, and sadness, with strong indications of physical and mental burnout. The work in exhausting environments, overloaded in order to compensate for high absenteeism, along with the fear of contamination and imminent death, marked their daily lives with a high risk of the loss of citizenship. Those workers suffered a loss of labor rights; faced unemployment; and were submitted to outsourcing, a loss of income, low wages, a lack of alternative transportation, and a lack of food.

This is the focus of the present article, to better understand the working conditions and biosafety conditions of Healthcare Professionals (HP) and the Invisible Healthcare Professionals (IHP) concering sociodemographic aspects, work shifts, working conditions, infrastructure, biosafety, and subsequent consequences in the professional routine of workers.

Methodology

The current study discusses work and biosafety conditions, considering the empirical findings from the studies "Work Conditions of Healthcare Professionals in the Context of Covid-19 in Brazil"3 and "Invisible Healthcare Workers: work conditions and mental health in the context of Covid-19 in Brazil"4. These studies conducted a detailed diagnosis of the situation of HP in general, by means of cross-sectional studies, with target populations of HP, who have a college level education, and IHP, individuals with middle and auxiliary levels who perform relevant activities in the health system but who are invisible in the work process. Both studies received approval from the Research Ethics Committee from the National Public Health School (*Escola Nacional de Saúde Pública* - CEP/ENSP), logged under Decision No. 4,081,914, CAAE no. 32351620.1.0000.5240.

The studies were conducted online, using the snowball sampling system, a kind of non-probabilistic sampling which, regardless of the limitations, sought to reach the health workers from diverse scenarios and different regions of Brazil, ranging from large urban centers to the most remote locations, thus not guaranteeing a full precision of the sample. The filling in of the online questionnaire by the subjects was done in a voluntary manner, respecting the principles of research ethics, and the subjects were informed about the Free and Informed Consent Term; the volunteer nature of their participation, with no embarrassment for the individuals in the case of refusal in participating; and the confidentiality of the questionnaire, with anonymous answers, with no possibility of identifying the provided data/information, directly or indirectly.

In the first study, 15,132 professionals from different jobs were interviewed (physicians, nurses, physical therapists, for example). In the second study, 21,480 workers participated, from more than 60 different mid-level and technical-level occupations and support.

The cut-off of this article was the working and biosafety conditions of HPs and the IHPs, with emphasis on sociodemographic profiles, weekly shifts, protection in the work environment, avail-

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ability of personal protective equipment (PPE), exposure to risk agents, training to fight the pandemic, predominant factors of change in professional routines, problems and ergonomic wear in the work environment and work shifts calculated by means of average percentage variation. The studies sought to establish comparisons between the two universes of studies in Brazil and geographic regions. For more information regarding the methodology of the aforementioned studies, access the article: "Changes in healthcare work: workers and future challenges", which can be found in this special edition of RC&SC.

Results

General characteristics of healthcare professionals and invisible healthcare professionals

Denominated here as HP and IHP, although they are in the same work environment and many share the same work processes, these two groups belong to distinctive and unequal worlds, with evidence of social discrimination when their work space is analyzed[3,4] (Chart 1).

On one hand, the HP, who have a university degree in the area of health, a significant portion with post-graduate degrees *lato* and *stricto sensu*, are in majority women (77.6%), given that 82.4% of those professionals are below 50 years of age, 38.4% aged 35 or younger; more than half are white (57.7%), and 39.9%, both black and brown-skinned individuals[3,4].

On the other hand, the IHP have diverse background in the area of health or other areas, with an education level ranging from elementary to higher education; a significant portion with technical or university degrees in the area of health. The IHPs are mostly women (72.5%), 83.2% are younger than 50 and 32.9% are 35 or younger; more than half are black and brown-skinned (59.0%) and 36.6% are white[3,4].

Work conditions

The work shift differs in the two surveyed universes: 51.6% of the HP reported shifts of up to 40 hours weekly and 47.6%, above 41 hours; as compared to the IHP, which reported 60.1% and 37.1%, respectively, suggesting analogous situations regarding the format of the contracts in the two groups. HPs tend to have more flexible contracts in terms of meeting the weekly workload, thus allowing for multiple employment opportunities in 24-hour on-cal positions; meanwhile the IHP, besides having to fulfill the work shift in the contract, do not have the same "flexibility" as the HP. Therefore, considering their low wages, they end up resorting, in their free time, to a "spare-time jobs" modality, almost always in activities outside the area of health, such as babysitting, manicure, cleaning, security, and delivery services, for instance, resulting in embarrassment regarding the identity of the health professional, in other words, their main activity in the health area does not support them, making them more susceptible to precarious work[3,4].

An *exhausting shift* is one that which puts the health and life of the workers at risk, and is not necessarily related to long hours of work. It also submits the workers to a kind of work that is intense and highly demanding for the worker. Data from studies are alarming: 47.4% of the HP and 50.9% of the IHP reported having exhausting shifts[3,4].

One sensitive point noticed in studies refers to the feeling of protection in the workplace. With a noticeable difference in percentage, most of the IHP, 52.9%, feel unprotected as compared to 42.2% of the HP. However, the rates regarding the feeling of protection must be seen as a warning for both. When asked about the reasons for this feeling, the *lack, scarcity, and inadequacy of the PPE* is the most common reason (for 23.0% of the HP and 22.4% of the IHP), as well as *inadequate structures and infra-structures* (14.9% and 12.7%, respectively). It is important to mention that 23.1% of the IHP mentioned the *generalized fear of being contaminated in the work environment*. Another reason for the feeling is the *insensitivity of management*, common for the two groups, especially when chaos due to the pandemic demanded sensitive, empatheticm and solidary management[3,4].

On the other hand, the risks to which HPs are exposed (Chart 1) suggest a hostile and dangerous work environment. *Biological risks* stand out (exponentiated by the pandemic), as do risks from physical agents (noise, ventilation, radiation, etc.) and *ergonomic risks*, translated into psychological or physiological stress by physical or mental effort, long journeys, repetitive activities, intense daily routines, which were most commonly pointed out among the HP and IHP[3,4].

In an environment where the work conditions are unfavorable, omission by public powers is evident when 53.8% of the HP and only 43% of the IHP had any training during the pandemic.[3,4]

Chart 1. General characteristics of the health professionals* and invisible healthcare professionals** in the area of health - Brazil.

Variables		Health Professionals (n=15,132)	Invisible Professionals (n=21,480)
General characteristics			
Sex	Male	22.1	25.6
	Female	77.6	72.5
	NR	0.2	1.9
Age	35 and younger	38.4	32.9
	36-50 years old	44.0	50.3
	51-60 years old	13.4	13.3
	61 and older	4.2	1.8
	NR	0.1	1.8
Color or race	White	57.7	36.6
	Black (light or dark skinned)	39.9	59.0
	Yellow	2.0	2.0
	Indigenous	0.2	0.5
	NR	0.2	1.9
Work conditions			
Weekly workload	Up to 40 hours	51.6	60.1
	41-60 hours	32.4	25.4
	61 hours or more	15.2	11.7
	NR	0.8	2.8
Exhausting workload	Yes	47.4	50.9
	No	51.4	45.6
	NR	1.2	3.5
Feeling of protection at work	Yes	55.9	44.4
	No	43.2	52.9
	NR	0.9	2.8
Reasons for not feeling protected	Lack, scarcity and inadequate PPE	23.0	22.4
	Generalized fear of contamination	18.0	23.1
	Inadequate structure and infrastructure	14.9	12.7
	Hospitalization flow inefficient	12.3	7.2
	Lack of technical training by the professionals	11.8	10.0
	Insensitive management	10.4	8.0
Exposure to hazardous agents	*Physical agents* (noise, vibration, heat, cold, luminosity, ventilation, humidity, unusual pressure, radiation etc.)	18.8	20.0
	Chemical agents (toxic chemical substances present in the work environments, as gases, smoke, fog, mist and/or dust)	8.3	10.0
	Biological agents (víruses, bacteria, fungi, parasites etc.)	32.2	32.1
	Ergonomic hazards (psychological and physiological stress due to physical and mental efforts, inadequate postures, long shifts, repetitive or monotonous activities, intense routine etc.)	28.4	26.3
	Risk of accidents (physical structure, furniture, inadequate lighting or installations, equipment without protection etc.)	12.3	11.6
Training for working in the pandemic	Yes	53.8	43.0
	No	27.6	37.3
	Self trained	17.7	17.1
	NR	0.9	2.6

*Physician, Nurse, Physiotherapist/Occupational Therapist, Dentist, Biomedical Scientist, Pharmaceutical/Biochemical Scientist, Psychologist, Social Assistant, Nutritionist, Speech Therapist, Biologist, Veterinarian, Hospital Administrator, Physical Education Teacher, Workplace Safety Engineer, Sanitarist, undergraduate interns(physician, nurse etc.). **Technician/Nurse's Aid, Technician - Oral Health aid/Dental Prosthetics aid, Pharmacy Technician/Aid/Homeotherapy/Hematology/Clinical Analysis aid, Technologist/Technician/Radiology Aid, Technician in Orthopedic Immobilization/Casts, Work Safety Technician, Health Vigilance Technician, Health Agents (ACS, ACE, VS and such), Indigenous Health/Sanitary Agent, stretcher carrier, Ambulance Driver, Brier and similar, Hospital KItchen personnel, Administrative personnel, Doorman/Receptionists/Telephone operator/Security, Cleaning and Conservation personnel, Maintenance workers.

Source: Research "Working Conditions of Health Professionals in the context of COVID-19 in Brazil" - ENSP-CEE/Fiocruz 2020/2021, and research "The invisible health professionals - working conditions and mental health in the context of COVID-19 in Brazil" - ENSP-CEE/Fiocruz, 2021/2022.

Nonetheless, they were in the frontline performing vital activities when faced with a serious epidemic, the worst global health tragedy ever.

Biosafety at risk

Although there is a wide range of documentation on IHPs, the data from studies suggest a disheartening reality, in Brazil and its specific regions, regarding the availability of PPE during the pandemic. When asked about *PPEs*, the results were the following: a) among the HPs, the percentage who reported 'yes' was 92.9%, as compared to 79.9% of the IHPs, regarding the use of 'procedure gloves'. As regards access to the 'N95/PFF2' mask, the percentages were 75.5% (PS) and 61.9% (TIS); b) none of the PPE items, in either group, reached values above 95%; c) 44.9% of IHPs reported that the establishments/companies where they work did not provide PPEs in the necessary quantity[3,4].

As regards the regional data concerning the availability of N95/PFF2 masks, inequalities were identified, which confirm the discrimination between HPs and IHPs, which stem from distinct and unequal universes. In the North region, 72.1% of the HPs had access to N95/PFF2 masks, as compared to only 61.4% of the IHPs. Even more discrepancy was found in the Northeast region, where 74.4% of the HPs had access, as compared to only 51.8% of the IHPs. In the Southeast region, the numbers are more similar, HPs (77.6%) and IHPs (70.9%); likewise, in the South, 76.6% of the HPs and 73.4% of the IHPs had access to masks. The Midwest region showed discrepancies that were similar to the North region, where 72.7% of the HPs and only 63.5% of the IHPs had access to masks. It is important to mention that the Northeast, as far as access and availability is concerned, stood out in terms of the region with the highest discrimination in PPE items[3,4] (Table 1).

When comparing nationwide data, there is a difference of more than 10% availability of PPEs for HPs and IHPs, which is significant when analyzing the inequalities in rights and recognition that produce unequal working universes in health. The economic fractures present in IHPs materialize into low wages, outsourcing, exhausting work shifts, which expose the social vulnerability of those workers. In a different level of inequalities and inequity, the regional data illustrates the realities of different "Brazils".

The low percentages referring to having resting structures (12.1%-13.6%), lunch and transportation vouchers (9.2% and 12.9%), among the HPs and IHPs, respectively, reveal the true dimension of the lack of importance given to a healthy work environment, in the production of value and citizenship policies for healthcare workers[3,4].

High ergonomic wear

Another item which is important to evaluate the work conditions refers to the *ergonomic wear* of the IHPs when performing their activities in the fight against the pandemic: nationwide data indicate that 47.9% were submitted to "high" and "very high" *physical and mental demands in the activities performed* (time restraints; constant interruptions, repetition of actions and movements; pressure to meet targets; little time to rest, etc.). On the other hand, when asked about *professional wear in the daily performance of their activities* (psychological stress, feelings of anxiety, mental burnout, etc.), the percentages of "high" and "very high" answers add up to 61.9%. The complaints by those workers are many and diverse, including problems of ergonomic discomfort in the workplace, inadequate infrastructure, excessive demands, pressure from superiors, and even more serious issues involving not only the physical environment but also the social environment in the workplace, including violence and discrimination in general[3,4].

The correlation between ergonomic wear and work shift indicates a causal nexus between increase in the work shift and ergonomic wear[3,4] (Table 2). The increase in work shifts results in a higher number of workers, more exposed to physical and mental demands in their daily work routine.

The ergonomic hazards during the pandemic have increased , be they due to greater stress; long work shifts; work overload; a fear of becoming sick or dying from COVID-19; the need to constantly deal with imminent or actual death; the continuous physical effort during the care and handling of sick individuals; transportation in stretchers; changing position in bed, especially in serious cases; or an intense routine of activities to be completed during one's work shift. Hazards caused by physical agents tended to be common in the health area during the COVID-19 pandemic, due to work overload in noisy spaces, such as the ICU units, with the presence of monitors, excessive light, changes in temperature due to excessive cold, the transportation of patients through warm corridors, as well as the work with exams which emit several types of radiation.

Table 1. Health Professionals and Invisible Healthcare Professionals according to availability of Personal Protective Equipment (PPE) - Brazil and its Regions *(More than one answer is allowed).*

EPI	Health professionals (n=15,132)				Invisible professionals (n=21,480)			
	Yes		No*		Yes		No*	
	V.Abs.	%	V.Abs.	%	V.Abs.	%	V.Abs.	%
Brazil								
Surgical mask	13,148	86.9	1,984	13.1	16,575	77.2	4,905	22.8
Mask N95/PFF2	11,423	75.5	3,709	24.5	13,289	61.9	8,191	38.1
Gown/Overall	12,262	81.0	2,870	19.0	14,367	66.9	7,113	33.1
Procedure gloves	14,056	92.9	1,076	7.1	17,171	79.9	4,309	20.1
Protective goggles	12,276	81.1	2,856	18.9	14,227	66.2	7,253	33.8
Headcap/Hairnet	12,871	85.1	2,261	14.9	15,185	70.7	6,295	29.3
Need to improvise	2,649	17.5	12,483	82.5	4,987	23.2	16,493	76.8
North region								
Surgical mask	1,542	84.3	288	15.7	1,893	73.1	698	26.9
Mask N95/PFF2	1,320	72.1	510	27.9	1,592	61.4	999	38.6
Gown/Overall	1,430	78.1	400	21.9	1,834	70.8	757	29.2
Procedure gloves	1,675	91.5	155	8.5	2,257	87.1	334	12.9
Protective goggles	1,370	74.9	460	25.1	1,733	66.9	858	33.1
Headcap/Hairnet	1,597	87.3	233	12.7	2,075	80.1	516	19.9
Need to improvise	436	23.8	1,394	76.2	740	28.6	1,851	71.4
Northeast region								
Surgical mask	3,254	87.2	477	12.8	5,048	73.7	1804	26.3
Mask N95/PFF2	2,774	74.4	957	25.6	3,547	51.8	3,305	48.2
Gown/Overall	3,003	80.5	728	19.5	3,679	53.7	3,173	46.3
Procedure gloves	3,478	93.2	253	6.8	4,519	66.0	2333	34.0
Protective goggles	2,982	79.9	749	20.1	3,632	53.0	3,220	47.0
Headcap/Hairnet	3,316	88.9	415	11.1	4,189	61.1	2663	38.9
Need to improvise	677	18.1	3,054	81.9	2,038	29.7	4,814	70.3
Southeast region								
Surgical mask	5,014	86.9	753	13.1	5,070	81.6	1143	18.4
Mask N95/PFF2	4,476	77.6	1,291	22.4	4,402	70.9	1,811	29.1
Gown/Overall	4,711	81.7	1,056	18.3	4,720	76.0	1,493	24.0
Procedure gloves	5,339	92.6	428	7.4	5,520	88.8	693	11.2
Protective goggles	4,712	81.7	1,055	18.3	4,671	75.2	1,542	24.8
Headcap/Hairnet	4,791	83.1	976	16.9	4,775	76.9	1438	23.1
Need to improvise	882	15.3	4,885	84.7	1,219	19.6	4,994	80.4
South region								
Surgical mask	1,976	87.6	279	12.4	2,841	86.0	462	14.0
Mask N95/PFF2	1,728	76.6	527	23.4	2,424	73.4	879	26.6
Gown/Overall	1,844	81.8	411	18.2	2,611	79.0	692	21.0
Procedure gloves	2,121	94.1	134	5.9	3,082	93.3	221	6.7
Protective goggles	1,931	85.6	324	14.4	2,713	82.1	590	17.9
Headcap/Hairnet	1,861	82.5	394	17.5	2,620	79.3	683	20.7
Need to improvise	320	14.2	1,935	85.8	466	14.1	2,837	85.9
Midwest region								
Surgical mask	1,355	88.1	183	11.9	1,456	82.4	310	17.6
Mask N95/PFF2	1,118	72.7	420	27.3	1,121	63.5	645	36.5
Gown/Overall	1,266	82.3	272	17.7	1,321	74.8	445	25.2
Procedure gloves	1,435	93.3	103	6.7	1,551	87.8	215	12.2
Protective goggles	1,275	82.9	263	17.1	1,291	73.1	475	26.9
Headcap/Hairnet	1,299	84.5	239	15.5	1,316	74.5	450	25.5
Need to improvise	333	21.7	1,205	78.3	421	23.8	1,345	76.2

*"No" correspond to the sum of "No" and "Rarely" answers plus the number of "NR" answers.

Source: Research "Working conditions of health professionals in the context of COVID-19 in Brazil" - ENSP-CEE/Fiocruz 2020/2021, and research "The invisible health professionals: working conditions and mental health in the context of COVID-19 in Brazil" - ENSP-CEE/Fiocruz, 2021/2022.

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Table 2. Invisible Healthcare Workers* according to ergonomic strain in the work environment in the face of the pandemic by workday - Brazil *(More than one answer is allowed).*

Ergonomic Wear	Up to 40 hours		41-60 hours		61 hours or more		NR	
	V.Abs.	%	V.Abs.	%	V.Abs.	%	V.Abs.	%
The physical and mental demands you are submitted to in carrying out your activities (time pressure, constant interruptions, repetition of actions and movements; pressure to reach goals, time to rest, etc.)								
Very low + Low	1,380	70.5	428	21.9	130	6.6	20	1.0
Regular	2,160	67.0	756	23.4	282	8.7	28	0.9
Very High + High	3,356	58.6	1,570	27.4	766	13.4	32	0.6
NR	459	44.2	129	12.4	40	3.9	410	39.5
Professional exhaustion in the routine of their tasks (HPicological stress, feelings of anxiety, mental exhaustion, etc.)								
Very low + Low	1,001	70.1	310	21.7	93	6.5	23	1.6
Regular	1,497	67.4	538	24.2	164	7.4	23	1.0
Very High + High	4,515	61.1	1,918	26.0	921	12.5	37	0.5
NR	342	37.7	117	12.9	40	4.4	407	44.9

*The sum of the 9,534 respondents from the parent survey was excluded, as this question was only present in the survey of invisible healthcare workers.

Source: Research "Invisible healthcare workers: work conditions and mental health in the context of COVID-19 in Brazil" - ENSP-CEE/Fiocruz, 2021/2022.

Machado *et al.*[5] reported that if the health crisis in the country was not bad enough, what was seen in the news throughout the pandemic was a scenario of workers who, besides the increased demand for healthcare, had to deal with a lack of PPE, infrastructure, and with inadequate working conditions; the precarity of work relationships; etc. The HPs in the frontline were often subjected to exhausting work and intense stressful activities, which places the health of the worker at risk, which is not merely related to long shifts. With the increasing adoption of temporary work contracts, this Health Workforce (HWF), mostly precarious, will begin to consist of millions of sick workers as a result of the after effects of the pandemic, associated with pre-existing comorbidities, a high level of unemployment, and workers who are unable to work. The scenario which is taking shape is that of a tired, stressed HWF, who shows signs of exhaustion and professional wear.

Changes in work routines: chaos in daily life

The predominant factors in the changes in the daily routines of the HPs who worked in the frontlines are shown in Figure 1, which expresses the research data in words, from the complexity of the work involving the fight against COVID-19 and the excessive and strenuous work process installed in the pandemic, leading to exhaustion, the deprivation of social and family life, as well as a work environment marked by the lack of protection due to the risk of fragile biosecurity to which the HPs were subjected, causing contamination and deaths.

The testimonies presented below show the opinion of the workers who answered the questionnaires, who freely expressed their daily life during the pandemic[3,4]. Exhaustion, extreme tiredness, and fatigue are present in each story:

The nursing team is tired, stressed, exhausted. We are devalued and unmotivated and now we are afraid of the second wave. We need support from the authorities and the appropriate agencies so we can have an active voice, and have the proper number of professionals to cope with the demand, a more dignified salary too. We are destroying our health to take care of others. We forget our families to take care of a beloved relative of someone that we don't even know. HELP US! (Nurse, HP study).

Very stressful. The team is exhausted. Many deaths, too much work, too much demand, anguished family. A lot of study and too much absence from home. No leisure time, missing the family (Physician, HP study).

Unfortunately, it's quite embarrassing, but it is the reality that we are living, nothing works according to protocol, we have to wear a mask that should be discarded after a couple hours, and we use, the same mask for two or three days …and the materials are scarce, sometimes we have to use

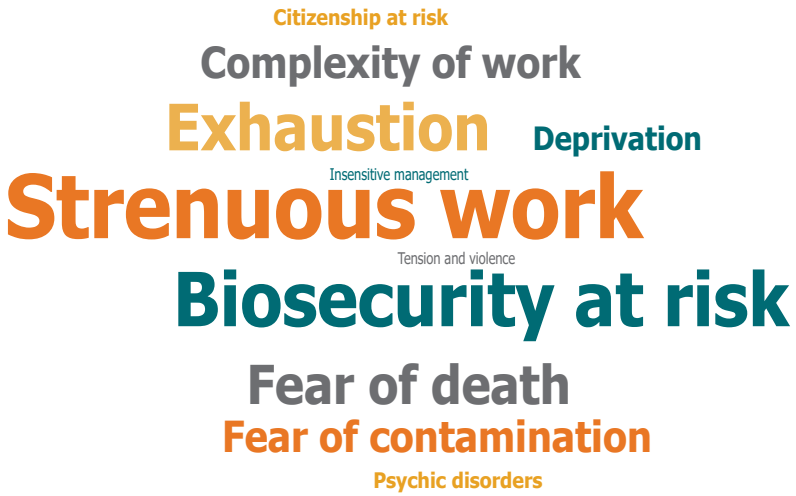

Figure 1. Predominant factors in changing the work routine of Invisible Health Professionals and Workers - Brazil.

Source: Research "Working conditions of health professionals in the context of COVID-19 in Brazil" - ENSP-CEE/Fiocruz 2020/2021, and research "The invisible health professionals: working conditions and mental health in the context of COVID-19 in Brazil" - ENSP-CEE/Fiocruz, 2021/2022.

the same equipment two or three times, transferring patients with COVID is a high physical risk, we used to have help before, now we have to pick up the stretchers ourselves, no matter the weight of the patient…besides all that, there is the workload, stressFUL and exhausting, and when the paycheck comes, we realized that we do not even get paid the sick leave compensation properly, the hospital only pays 20% (Ambulance driver, IHP study).

The fragile biosafety conditions, the imminent risk of contamination and death, the poor working conditions are described by those who must deal with those situations:

A very difficult time for health workers who are in the frontline in the fight against the pandemic. Difficult, since the health conditions at SUS were not the best before the pandemic. There was a delay in the arrival of PPEs, and their quality and quantity was questionable. We had to buy our own PPEs, so that we could get started with the procedures in the beginning of the pandemic. We still have to get our own equipment, since what we get from management is not all of the necessary PPEs. The routine changed a lot and the pressure on the workers in the frontline became nearly unbearable (Dental surgeon, HP study).

We warm up our packed lunch on the ambulance hood. We do not have any rights. We don't even exist in Health (Ambulance driver, IHP study).

In order to follow the required protocols for biosafety and to be able to do efficient work, we need to have the adequate garments and better working conditions. We end up having to use n95 masks for 15 days. And working in an ICU (Technician/oral health assistant, IHP study).

The contemplation made by the HPs and IHPs regarding the moment of pandemic crisis leads us to reflect on the work conditions in the post pandemic context, since that scenario of unprotection, fragile biosafety, and poor working conditions described here was not caused by the pandemic; they were simply worsened and deepened by it[3,4]. Environments with exhausting work processes and work overload are recurring problems in the daily routines of HPs. The fear of contamination and imminent death follow them on a daily basis, with management defined by the risk of confiscating worker citizenship (loss of labor rights, outsourcing, unemployment, loss of income, low wages, extra expenses with PPEs, alternative transport and diet.

DISBELIEF AND DISRESPECT by the population and the management. The population, even after all the suffering we endured, is unfortunately still disregarded during COVID. As far as management goes, unfortunately, your contamination or mine, it doesn't matter, there was a lack of assistance, or support. In short, it does not matter how much you do. If we get sick, it's a lie, we have no

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assistance. It's absurd (Technician/Nurse's aid, IHP study).

The most important lesson I learned from the pandemic is that, when we needed professional support the most was the moment that we were exploited the most, corruption was unprecedented. And everyone, the people and the professionals like us are paying a high price (Burier, IHP study).

Death imprinted on the work environment during the pandemic

According to WHO estimates, 115,000 health professionals, victims of COVID-19, had already died in the world by May 2021. In Brazil, there was no systematization of the numbers of infected people and deaths among HPs, except for the Federal Council of Medicine (CFM)[6] and Federal Council of Nursing (COFEN)[7], which began to count the deaths in their professional category. A study carried out by Fiocruz on the deaths of physicians and nursing staff shows that, by October 2021, there were 893 deaths among physicians and 873 among the nursing staff, 617 among nursing assistants/technicians, and 256 among nurses across the country[8] (Graph 1).

Discussion

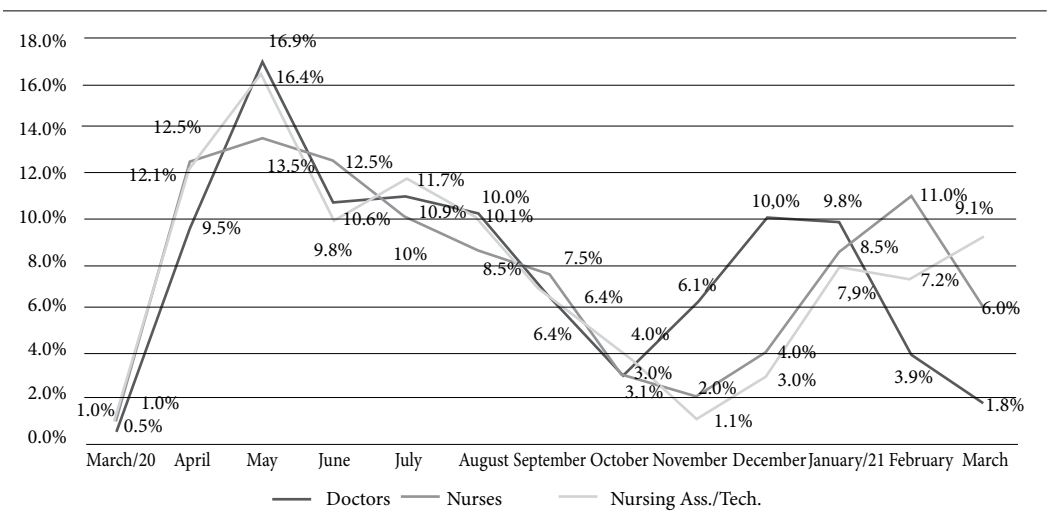
Activities in the health area are structured around human action, and the workers are the active subjects who think, act, and feel during their work activities; they are not restricted to prescribed activities, since at the same time, those individuals/workers act in favor of their own wellbeing in the individual-environment-activity relationship[9].

The work universe in Brazil is going through a precarization process, with deregulation, legal insecurity, a loss of labor rights due to the flexibilization of infra-constitutional legislation, and the State handing over its typical functions to the private sector[10,11].

Work conditions were affected severely during the pandemic due to sudden changes and emergency in the routine of health services, reaffirming the fragile work conditions related to the individual-environment-activity relationship that already existed in the health area in Brazil.

The pandemic exacerbated the situation, showing risks that included occupational infection by COVID-19, skin lesions caused by the prolonged use of PPE, exposure to toxins due to an increase in the use of chemical agents, including disinfectants; psychological suffering; chronic fatigue; as well as stigmatization, prejudice, and physical, psychological violence and harassment[12].

In the healthcare work environments, infrastructure is planned in conformity with the activities to be performed in different spaces (hospitals, health centers, etc.). It is a key element in ensuring the quality and the safety of the services provided to the population, which includes as-



Graph 1. Deaths of physicians, nurses, and nursing assistants and technicians by month of death - Brasil.

Source: Machado *et al.*[8] (p. 416).

pects like the physical structure of the facilities, the available equipment and material resources, and accessibility to health facilities.

Infrastructure plays a key role in the prevention and control of infectious diseases, as can be seen in the case of COVID-19. Availability of PPEs and adequate resources, such as ventilation systems, are crucial to prevent the transmission of disease in healthcare environments. One study conducted in healthcare facilities in Brazil during the pandemic identified the need for improvements in the infrastructure of the facilities so as to ensure the safety of the workers and the users[13].

It is essential to evaluate the hospital structure in order to ensure the quality and effectiveness of the services provided. Some studies have shown the need for regular evaluations of the hospitals' capacity to cope with emergency situations, as in the case of the COVID-19[14,15] pandemic. That includes: availability of medical equipment, such as ICU beds and respirators, as well as PPEs and adequate training for the medical teams[16]. Aspects such as accessibility, efficiency, and effectiveness of the services rendered must all be considered[17].

One efficient example of the evaluation tool is the Scale of Infrastructure in the Basic Health Units (BHUs), as developed by Soares Neto *et al.*[18], which evaluates the material conditions of the facilities, is therefore able to monitor the evolution of those conditions.

On the other hand, the quick evolution of the pandemic demanded a reorganization of the health system's infrastructure and caused several crises due to lack and/or non-existence of specialized equipment, such as respirators and ventilators, thus demanding greater density or even a technological transition. There was, specifically, a lack of sufficient workers to cope with the demands at every level of health care.

According to Vedovato *et al.*[19], working conditions are understood as "situations related to the physical and material means to perform activities". Therefore, situations which consist of the physical environment and the provision of inputs thus contribute to the deterioration of the work environment.

By contrast, biosafety refers to a set of actions aimed at preventing, controlling, reducing, or eliminating hazards inherent to activities that may interfere in or compromise one's quality of life, human health, and the environment. This means that fails in biosafety actions also contributed to the deterioration of working conditions in health care[20].

In the area of health, biosafety is regulated by the Biosafety in Health Commission (*Comissão de Biossegurança em Saúde* - CBS) whose purpose is to define strategies for the intervention and follow-up of biosafety actions, considering the different activities performed in the health area.

During the pandemic, following the guidance of the World Health Organization (WHO), the Ministry of Health (MS), the National Agency for Health Vigilance (ANVISA) and CBS, health facilities followed specific protocols for the activities performed in the area of health services, seeking to reduce the risk of contamination and death of the patients and HPs in the context of COVID-19. Regardless of the recommendations by regulatory agencies, the actions implemented during the pandemic were not enough to prevent a health crisis, which translated into the contamination and death of the workers.

Work related hazards can be considered as any event that causes harm to the worker in the work environment, be it in the form of accidents, diseases, or the suffering by the HPs, or even provoked by pollution in the work environment.

One of the strategies to reduce risks in the workplace is the creation of a hazard map. Such a map must be posted in visible places, guiding the workers. It is considered to be an important technical element for safety in the workplace and was established by Decision No. 5 from 08/17/1992 by the National Department for Workers Safety and Health, and modified in 1994[21], by Decision No. 25[22], which made the map mandatory, and to be created by an Internal Commission on Accident Prevention. Occupational hazards in health are also regulated by Regulatory Norm No. 32[23]. However, besides the existence of laws and norms, there is also a need to understand the work of HPs when faced with situations of occupational hazards, so that effective preventative actions can be taken[24].

With COVID-19 and the new work configuration imposed by the pandemic, the risks to health damage increased, creating new subcategories. The speed of origin of new risks is greater than that of prevention, and the approach to workers is necessary to identify, as pointed out by Almeida *et al.*[25]:

You feel difficulties that did not exist before; you need to perform tasks alone that were previously performed with the help of colleagues; you need to do the work without the equipment recommended as the ideal; you need to use equipment and resources that are new and/or different from

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the usual ones; you are forced to do something that should be postponed, done by another colleague, or with the help from colleagues or with materials that are not available; you need to extend the workday or accelerate your way of working in an unusual manner; without receiving orders from anyone, you feel forced to do something, have to do it faster and not always with the recommended resources[25](p.5).

Ergonomics nowadays prioritizes the individual, who comes to be understood as an active subject who thinks, acts, and feels; through his work activity, he builds and rebuilds his daily experience. Likewise, work has changed and is now understood as a human action of adaptive mediation (regulation) through which workers respond to contradictions (problems, difficulties, limits, critical indicators) that exist in work environments. Moreover, workers act in favor of their wellbeing in the individual-environment-activity relationship. Therefore, ergometric risks become those that compromise physical and mental health and wellbeing at work, that is, they compromise the quality of life of the individual worker as a function of the activity[26].

One of the issues that most affected the wellbeing and mental health of HPs was the fear of dying and becoming ill due to the growing number of deaths caused by contamination among HPs. Therefore, it is "necessary to correlate the contamination and death rates of these professionals with the working conditions to which they are exposed, on a daily basis, in serving the population seeking assistance, that is victimized or suspected of having COVID-19"[27].

The consequences of COVID-19 observed among workers and which have been impacting the institutional daily life due to the volume of leaves caused by sequelae, require a reshaping of this group[8].

Considering that the sampling in the snowball methodology is not probabilistic, the data inferences are from the studied population, which totaled 36,612 workers, including 15,132 HPs and 21,480 IHPs, covering all states and regions and maintaining a proportionality with the surveyed universe, thus producing a significant sampling that represents the universe of HPs and IHPs.

Final notes

The work when faced with COVID-19 has caused exhaustion among all workers, be they HPs or IHPs. This exhaustion comes not only from the proximity to the high number of cases and deaths of patients, professional colleagues, and family members, but also from the significant changes that the pandemic has caused in their personal wellbeing and professional life.

The fear of contamination and imminent death accompany their daily lives in actions marked by the risk of the confiscation of one's worker citizenship (the loss of labor rights, outsourcing, unemployment, a loss of income, low wages, extra expenses needed to purchase PPEs, as well as for alternative transportation and food. It is necessary to reverse this situation of imminent risk to our healthcare workers due to the strenuous work pace, with work overload and high absenteeism among them. This reality is not restricted to the pandemic, it is the legacy of decades of the non-prioritization of work management.

The new coronavirus pandemic has deepened the inequalities, exploitation, and prejudice that fall upon the group of more than two million workers who carry out support activities in nursing assistance (the IHP) in the care provided and in the fight against COVID-19.

By contrast, regardless of whether they are HPs or IHPs, the data analyzed in this article exposes a worrisome picture regarding work conditions, denoting a deterioration of the work environment, making it hostile and unhealthy for the daily life of workers during the pandemic. However, data from previous surveys show that the situation of work conditions in health was already precarious, producing physical and mental illnesses among workers in general, which was heightened with the pandemic.

In a kind of *signus*, living, working and living socially have become a challenge for HPs during the pandemic, synonymous with vulnerability, risk, illness, and death, "derived from work conditions, the magnitude and breadth of risks, often imposed due to unhealthy work conditions and the multiple shifts to which they are subjected"[28].

However, the construction of policies that seek to change and improve the work environment in health, making it healthy and adequate, requires an assessment before, during, and after the pandemic, that is, to analyze the level of precariousness of working conditions in the workplace during the pre-pandemic period, during the pandemic period, and in the post-pandemic period in which HPs and IHPs carry out their activities on a daily basis. It is strategic to associate and correlate situations of precarious employment relationships, job insecurity due to

temporary contracts widely used in healthcare to hire personnel to which they are subject, with the existing work conditions in health establishments, focusing on the life and wellbeing of the health worker. The work environment in health, in particular, cannot be the cause of illness and suffering for those who are providing care to the population. Taking care of those who take care of all of us.

On the other hand, critically nominated by the survey as "invisible workers", they must be noticed, recognized, and valued for their imperishable functions in the prevention, promotion, and reoccupation of user health. The deleterious invisibility needs to be overcome in the healthcare environment.

Likewise, it is urgent to institute a systematic evaluation policy for the infrastructure of health services in Brazil. The lack of adequate infrastructure can lead to unfavorable work conditions, making it difficult to serve users and compromising the quality of services rendered. It is well-known that the pandemic greatly aggravated the weaknesses of the existing infrastructure, however, it is also known that these weaknesses are present in the daily life of health services, a fact that largely affects work conditions in the health area and severely compromises worker health.

Therefore, investing in the working conditions of workers is a major challenge in SUS, considering that the quality of life at work brings physical, emotional, and psychological wellbeing to the worker. It is vital to promote investment in health and care for its workers, considered by the WHO as a public good those who work at the service of humanity.

Collaborations

MH Machado, MCR Coelho, EJ Pereira, AO Telles, JJ Soares Neto, FRG Ximenes Neto, EG Teixeira, JN Bembele, LG Silva and FL Vargas participated in the conception and design of the study, write-up and review of the intellectual content, as well as the final version of the manuscript.

Acknowledgements

The referent studies that produced the origins of this article and other articles (from the research team) received financial support from: Programa Fiocruz de Fomento à Inovação - Inova Fiocruz, and the Programa de Políticas Públicas e Modelos de Atenção e Gestão de Saúde (PMA) of the Vice-Presidency of Research and Biological Collections (VPPCB) at Fiocruz.

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Article submitted 20/10/2022
Approved 01/06/2023
Final version submitted 28/06/2023

Chief editors: Romeu Gomes, Antônio Augusto Moura da Silva