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Nursing professionals' biosafety in confronting COVID-19

Biossegurança dos profissionais de enfermagem no enfrentamento da COVID-19

Bioseguridad de los profesionales de enfermería en el afrontamiento del COVID-19

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ABSTRACT

Objective: To investigate the nursing professionals' biosecurity in confronting COVID-19. **Methods:** This is a Survey type study. Nursing professionals were invited via messaging apps, using self-applied data collection forms. The sample selection (n=693) was non-probabilistic. A descriptive data analysis was conducted. **Results**: considering the biosafety aspects in facing COVID-19, 79.0% of the participants had not received training or considered it insufficient, 69.3% reported the lack of personal protective equipment during work, and 81.8% did not feel safe with the internal flux adaptations for handling COVID-19 cases. **Conclusion**: Continuous and effective nursing team training and personal protective equipment availability are necessary, as well as internal flow adjustments for attending suspected or confirmed cases. **Descriptors:** Biosafety; Coronavirus Infections; Nursing; Coping Behavior; Containment of Biohazards.

RESUMO

Objetivo: investigar a biossegurança dos profissionais de enfermagem no enfrentamento da COVID-19. **Métodos:** trata-se de estudo do tipo Survey. Os profissionais de enfermagem foram convidados via aplicativo de mensagens, utilizando formulários de coleta de dados autoaplicáveis. A seleção amostral (n=693) foi do tipo não probabilística. Realizou-se a análise descritiva dos dados. **Resultados:** considerando os aspectos da biossegurança no enfrentamento da COVID-19, 79,0% dos pesquisados não receberam treinamentos ou consideraram-nos insuficientes, 69,3% relataram a falta de equipamento de proteção individual nos serviços e 81,8% não se sentiram seguros com as adequações dos fluxos internos para o atendimento de casos da COVID-19. **Conclusão:** observam-se a necessidade de treinamento contínuo e efetivo da equipe de enfermagem e a disponibilidade de equipamentos de proteção individual, além da necessidade de adequações dos fluxos internos para o atendimento de casos suspeitos ou confirmados da doença.
Descritores: Biossegurança; Infecções por Coronavírus; Enfermagem; Enfrentamento; Contenção de Riscos Biológicos.

RESUMEN

Objetivo: investigar la bioseguridad de profesionales de enfermería en el afrontamiento del COVID-19. **Métodos:** es un estudio tipo Survey, realizado entre profesionales de enfermería por aplicación de mensajería mediante formularios de recogida de datos autoaplicables y análisis descriptivo de los datos. La selección de la muestra (n=693) fue no probabilística. **Resultados:** al considerarse los aspectos de bioseguridad para el afrontamiento del COVID-19, el 79,0% de los investigadores no había recibido capacitación o la consideraba insuficiente, el 69,3% reportó falta de equipo de protección individual en los servicios y el 81,8% no se sintió seguro con las adecuaciones de los flujos internos para la atención de casos del COVID-19. **Conclusión:** se observa la necesidad de capacitación continua y eficaz del plantel de enfermería y la disponibilidad de equipos de protección individual, además de adecuaciones de los flujos internos para la atención de casos sospechosos o confirmados de la dolencia.
Descriptores: Bioseguridad; Infecciones por Coronavirus; Enfermería; Afrontamiento; Contención de Riesgos Biológicos

INTRODUCTION

The challenges caused by the COVID-19 pandemic have called into question the world's ability to respond to a virus with rapid dissemination by the respiratory route. Some factors increase the emerging and widespread risk of respiratory pathogens, such as growing populations, climate change, increased international travel, rapid urbanization, and immigration. Although there are technologies available to contain the dissemination of such disease, in COVID-19's case, it was not possible to avoid the significant death toll and the difficulties in controlling the disease's incidence, which put the world's public health at risk[1].

The current situation of the COVID-19 pandemic challenges governmental and health authorities regarding the agility for the response to this public health emergency, especially regarding the adoption of preventive measures, early detection of cases, and the care capacity at the several complexity levels in health care[2]. Despite effective measures records to combat infectious diseases caused by emerging viruses, the efforts to confront COVID-19 have not been effective and sufficient to control the disease dissemination. The vaccine unavailability at the pandemic onset aggravated more intensely the worldwide impact caused by the new coronavirus infection[3].

In December 2019, the World Health Organization (WHO) received an alert from the Wuhan City, located in Hubei Province, People's Republic of China, about the outbreak of several pneumonia cases. The previously unknown virus causing the disease was called a new coronavirus (SARS-CoV-2), causing COVID-19[4]. Unlike other human respiratory coronaviruses, SARS-COV-2 has the ability to transmit from asymptomatic cases, and this factor affects the ability to contain the disease's spread. At the beginning of this pandemic, available technologies which were able to stop the virus dissemination and interrupt the transmission chain were individual protection measures, social distancing, and testing to identify new cases and thus, promote isolation during the disease's transmissibility period[5].

In this challenging context, some professional categories, given the nature of their activities, have not adopted the prophylactic measures related to social isolation. Among these workers, there are health professionals. Therefore, to minimize the contamination risks or become transmission vehicles, the correct use of personal protective equipment (PPE) is necessary[6-7]. However, the global supply shortage, coupled with logistical difficulties in the distribution and large-scale testing availability, presented themselves as additional obstacles in facing the pandemic[8].

The health professionals' maintenance in the forefront against COVID-19 has become a challenge, especially considering the availability and proper PPE usage, continuing education, the establishment of flow and functional care spaces, in order to minimize the sickening risks, sick leave, and health professionals' fatalities in general. In this perspective, biosafety measures are necessary should be established so that health professionals work with protection. Biosafety is characterized as a set of actions aimed to prevent, control, reduce or eliminate risks inherent to professional activities and promote the care quality[6].

Nursing professionals are essential to tackle COVID-19. In addition, they are the professionals who remain longer in direct patient care, which places them as more exposed to the contamination risks[9-10]. Possible gaps in training, input unavailability, or failures in their use may increase the risks of illness, sick leave, and deaths. Performing the biosafety diagnosis regarding nursing professionals who attend suspected or confirmed COVID-19 cases may contribute for the adoption of more effective prevention strategies.

OBJECTIVE

To investigate nursing professional's biosecurity in confronting COVID-19.

METHODS

Ethical Aspects

The ethical precepts of Resolution 466/2012 of the National Health Council were respected, and the research was approved by the institutional Research Ethics Committee.

Design, period, and study site

This is a survey study, with exploratory and descriptive purposes, based on a quantitative approach, with a longitudinal design by trend. Strengthening the reporting of observational studies in epidemiology (STROBE) guidelines were adopted to guide the study. Data were collected from April 15 to May 16, 2020. Participants in this research included nursing professionals working in Brazil.

Population or sample; inclusion and exclusion criteria

The target population comprises the nursing team that works in healthcare settings of several Brazilian states. The professionals were invited to participate in the research personally and directly, and they could choose to accept the invitation or not. The contacts were made through the social network via the WhatsApp application, through which the forms were made available. To the participants, it was guaranteed the respect for law no. 13.709/2018, which deals with the protection of personal data[11]. For the sample, a 10% proportional estimate of the study's target population was established to obtain a reproducible quantitative. For sample calculation purposes, we used a population estimate for categorical outcomes, with a 1.96 confidence level for 95%, and a 25% proportion estimate of favorable outcomes and a 5% standard error, adding 10% to guarantee possible sample loss, reaching a total of 693 individuals. The participants were chosen using a "snowball" strategy[12], in which the professionals who answered the form invited new participants from their friends and acquaintances network.

The study included nursing workers working in healthcare units with high, medium, or low complexity, which treated Coronavirus infection cases. Nursing professionals who work in health service management or administrative areas were excluded.

Study protocol

The participant selection method was based on non-probability characteristics, with similarity-based selection, in which participants

are chosen because they represent similarities. The collections ended when the sample size N was reached.

The variables considered in the study were sociodemographic: background, age, gender, residents' numbers in the same nosocomial, working years, nursing category, public or private work unit profile, and employment number. Regarding training, the professionals were asked whether they received it, where it took place and who delivered it, if the evaluation was sufficient or insufficient, as well as the interviewee's opinion on the Hospital Infection Control Committee (HICC) unit's performance where they were linked.

We also asked about the appropriate protective mask use against the virus dissemination for droplet or aerosol prevention, whether there were changes in the environment or workflow, such as the availability of a specific place for breastfeeding, changes in living spaces, and about the using and washing clothes during care. In addition, the professionals were asked if they felt safe with the measures adopted, about the PPE lack in the work units, if there were infection cases among the professionals in the institutions, and contamination fear by COVID-1.

Data collection was based on a self-administered structured questionnaire, sent via WhatsApp, with objective questions, some offering space and the chance for additional discursive answers. The questionnaire had its questions designed to cover all interest points to the research.

Results analysis and statistics

Data were recorded with double entry, by the researchers themselves, in an electronic data spreadsheet (Microsoft Excel®) and exported to SPSS software, version 25. Data analysis was conducted using descriptive statistics and was classified according to the study's variables through the frequency distribution and respective percentages for categorical variables, as well as the central tendency measures, mean and standard deviation for numerical data.

RESULTS

The sample (n=693) included nursing professionals working in 18 Brazilian states, being represented by 658 (95.0%) who work in Pernambuco, Paraiba, Rio Grande do Norte, and Bahia state (Table 1).

The nursing professionals surveyed were predominantly female, 842 (91.5%) were less than 50 years old, and a little more than half, 401 (57.9%), had between 5 and 20 years of experience as a nursing professional (Table 2).

In the sample surveyed, 468 (67.4%) reported that there were confirmed cases of COVID-19 among health professionals in the unit where they work. By considering biosafety aspects, it was identified that 548 (79.1%) of those surveyed had not received training or considered the training insufficient. In the in-person training, the nurse professional stood out as a mediator (Table 3).

The safety feeling with the measures adopted in the units where they work was reported only by 126 (18.2%), 567 (81.8%) said they did not feel safe with the modifications implemented by the institutions to cope with COVID-19 cases. The PPE lack was noted by 480 (69.3%) surveyed. 649 (93.7%) respondents mentioned the fear of contracting the disease.

Table 1 - Professionals' percentage distribution per Brazilian state, Recife, Pernambuco, Brazil, 2019

State	n	%
Alagoas (AL)	01	0.1
Bahia (BA)	22	3.2
Ceará (CE)	06	0.9
Goiás (GO)	02	0.3
Mato Grosso (MT)	03	0.4
Mato Grosso do Sul (MS)	02	0.3
Minas Gerais (MG)	02	0.3
Pará (PA)	01	0.1
Paraíba (PB)	43	6.2
Paraná (PR)	02	0.3
Pernambuco (PE)	566	81.7
Piauí (PI)	02	0.3
Rio de Janeiro (RJ)	05	0.7
Rio Grande do Norte (RN)	27	3.9
Rio Grande do Sul (RS)	01	0.1
Santa Catarina (SC)	01	0.1
São Paulo (SP)	05	0.7
Sergipe (SE)	02	0.3

Table 2 - Nursing professionals' sociodemographic data distribution, Recife, Pernambuco, Brazil, 2019

Evaluated Factors	n	%
Gender		
Female	614	88.6
Male	79	11.4
Age in years		
Up to 30	208	30.0
31 to 50	426	61.5
>50	59	8.5
Minimium – Maximum	20-65	
Median ± Standard Deviation	36.49±8.7	
Residents in their home		
1-2	267	38.5
≥ 3	382	55.1
I live by myself	44	6.3
Category in Nursing		
Nursing Assistant	07	1.0
Nurse	516	74.5
Nursing Technician	170	24.5
Professional experience in years		
< 1	10	1.4
From 1 to 5	192	27.7
> 5 to10	210	30.3
>10 to 20	191	27.6
>20	90	13.0
Minimium – Maximum	00-40	
Median ± Standard Deviation	10.9±7.9	
How many health places do they work		
1	342	49.4
2 to 3	326	47.0
More than three	25	3.6
Work unit(s) profile		
Private	80	11.5
Public	536	77.3
Public e Private	77	11.1

About the knowledge over individual protection measures in the virus dissemination, we noticed that a significant number of professionals mention mistakes, especially regarding the mask usage recommended for protection against droplets (Table 4).

Regarding the internal sector flow, personal clothing usage during care provided and the absence of a specific place for breastfeeding stood out as unsafe measures (Table 5).

Table 3 - Data distribution related to the nursing team's biosafety, Recife, Pernambuco, 2019

Evaluated Factors	n	%
COVID-19 Training		
No	309	44.6
Yes	384	55.4
Training Location		
Not applicable	309	44.6
Distance education-ED	82	11.8
In-person (at the unit)	302	43.6
If it was in-person, who delivered it		
Nurse	139	20.1
Nurse HICC*	96	13.9
HICC Doctor	20	2.9
Unit Physician	29	4.2
Not applicable	391	56.4
Other	18	2.6
Evaluation about the training		
Insufficient / I have doubts	239	34.4
I received no training	309	44.6
Sufficient	145	21.0
Opinion about HICC performance		
Intermediate performance	171	24.7
Very active	84	12.1
It does not exist in the unit	144	20.8
Low performance	294	42.4

**HICC - Hospital Infection Control Committee*

Table 4 - Knowledge about measures to protect against the virus dissemination, Recife, Pernambuco, 2019

Evaluated Factors	n	%
Mask recommended for droplet transmission		
Surgical Mask	419	60.5
PFF1	08	1.2
PFF2 or N95	218	31.5
Any of the above	48	6.9
Mask Recommended for Aerosol Transmission		
Surgical Mask	22	3.2
PFF1	01	0.1
PFF2 or N95	662	95.5
Any of the above	08	1.2

[1] p value of the Chi-square test for proportion comparison.

Table 5 - Staff flow in the units' areas during the pandemic period, Recife, Pernambuco, 2019

Evaluated Factors	n	%
Change in the living spaces where you work		
No	271	39.1
Yes	422	60.9
A specific place for doffing		
No	408	58.9
Yes	285	41.1
Use of the same clothes in different hospital units		
No	502	72.4
Yes	191	27.6
Laundry used in the care provided		
The clothes are provided by the hospital and stay there to be washed	332	47.9
My clothes are mine, and I take them home	267	38.5
Clothes are mine but stay within the hospital to be washed	07	1.0
Not applicable	87	12.6
There was a change in the communal unit's areas flux		
No	256	36.9
Yes	437	63.1

DISCUSSION

The contributions brought by this study for the COVID-19 pandemic control demonstrate the need for continuous nursing staff training and structural and material resources available to ensure biosafety for these professionals, who are essential in containing the disease cases. The urgency to make PPEs available in adequate quantity and quality is added to the need for continuing education, assistance flux readjustment in the workplace, and general prevention measures adopted by the community. In order to meet the needs imposed by the significant number of infected people, the professionals' safety maintenance is a priority and depends on procedures that should be adopted collectively.

In this sense, we suggest exploring the knowledge that nursing professionals already have about biosafety measures from an andragogical methodology perspective. The andragogy application in health has been more used in professional training or patient education, and it is still rarely used in a continuing education perspective for health professionals[13]. Although this strategy is still barely used to train health professionals, adult learning theories are fundamental in professional education since they focus on identifying and dealing with the differences between what professionals already know and what they learn from training[14-15].

In addition to the theoretical approach to learning, the Permanent Health Education Policy (PHEP) should be considered and used continuously. The PHEP proposal produces and systematizes knowledge related to training and development for learning that happens on the job and proposing that learning and teaching are linked to the health equipment's daily routine. This policy intends to change health workers' daily routines using the significant learning that transcends the concepts acquired individually and reaches changes in teaching practices, didactic guidelines, curricular guidelines, and health practices[16].

The gaps in training and continuing education are added to the reports about the PPE shortage. It is important to emphasize the need for governmental efforts and healthcare facility managers to make PPEs available in adequate quantity and quality, as well as the establishment or readjustment of workplace attendance flow to enable meeting the needs imposed by the infected people; and in maintaining the professional's safety.

It appears that the sociodemographic profile presented has a significant female share. The demographic characteristics concerning gender are historically attributed to the nursing profession since care is socially linked to the female figure. In this aspect, it follows the global trend towards feminization in health and nursing services[17].

Given the COVID-19 pandemic extent, there is a tremendous global challenge to health services; due to the significant amount of infected individuals, there is a considerable increase in demand in the hospitalization rate in the same period, associated with the need for greater financial, human and physical resources support to contain the virus[18]. In this

perspective, within health institutions, the moment imposed to the many workers' categories an extensive workload and journeys, especially for the nursing team, essential professionals caring for people affected by the new coronavirus.

Considering that these frontline professionals provide direct care to patients and, consequently, are more vulnerable to contracting the infection, the eminent exposure causes, besides physical exhaustion, mental illness, especially in the delicate period when caution and strict biosafety are most needed in order to avoid their own removal from their activities. However, reality imposes conflicting circumstances, work overload, long working hours, stressful environments, and divergent conditions in the work process, which involves feelings and emotions such as fear related to the high viral transmissibility, death situations, and, above all, concern about contaminating family members[19-21].

Regarding healthcare workers' emotional aspects, the resources available for adequate personal protection are an essential component of public health measures to address the pandemic, as well as professional safety. Insufficient PPE and the feeling of being unprotected can generate psychological suffering. A sense of insufficient support, vulnerability perception, and concern about being a disease disseminator with high lethality potential for family and friends can intensify the individual pressure suffered by the health professional, thus compromising safety[22].

The infection risk mitigation among healthcare workers is linked to several factors that relate to the availability and personal protective equipment usage, structural resources in health units that allow the proper removal of such equipment, hand washing and masks available for symptomatic patients during care, in addition to general measures, such as maintaining the distance between people and respiratory etiquette[23]. Measures such as intensive patient triage with nonspecific symptoms and health professionals with mild symptoms are added to the measures cited in the virus containment and health professionals' contamination[24].

Making PPEs available in sufficient quantities does not guarantee the safety of health professionals or patients since proper use depends on timely training by experienced professionals. The worldwide supply crisis that occurred at the pandemic outbreak, coupled with doubts about the safety potential guaranteed by the equipment and the continuous education deficit, can contribute to a more significant insecurity perception by the professional, generating fear of contamination and work abandonment[25]. Continuity in the educational process among professionals and active methodologies are increasingly necessary to dispel existing doubts, rescue previous knowledge about the measures and adapt the practice to the reality presented.

In addition to the proper PPE use, appropriate spaces are necessary for their safe placement and removal so that contamination does not occur in the team or in the environments where professionals and patients circulate. Internal flows in health care units that prevent people's circulation between potentially contaminated areas are essential for infection control by COVID-19. In the same sense, encouraging the creation of spaces for rest, snacks, and relaxation is crucial for the assignment's development, especially during exhausting working hours. Such measures improve mental health and professional life quality[26].

Despite all the efforts to keep the front line ready to act in the fight against the new coronavirus, healthcare professionals also appear on the news among those affected by COVID-19. The reported cases and nursing staff fatalities reverberate the possible weaknesses in protective measures and place fear and insecurity in those who remain in their work fields. Worldwide, more than 260 nursing professionals have died, and 90 thousand are infected with the disease[27]. In Brazil, out of 98 nursing professionals killed by COVID-19, 25 were nurses, 56 technicians, and 17 nursing assistants[28].

Given the importance of nursing in the fight against COVID-19, some reflections are urgently needed. Although governments and the population has seen nursing professionals quite frequently during the pandemic, nurses found themselves exposed, falling ill, and dying for lack of adequate equipment, training, and government support. Healthcare underfunding has been occurring for years, and it is noticeable that the workforce and the available resources were not enough to contain the pandemic, which left the nursing team even more vulnerable to death just by continuing to exercise their profession. May this historic moment contribute to better working conditions, training, remuneration, and consolidation of this prominent position due to the importance of nursing in the multi-professional health team[29-31].

Study Limitations

The survey study type is a limitation since its participation requires participants' motivation, honesty, ability, and commitment to answer the questionnaire. Furthermore, in this study, the predominance of participants from the Pernambuco state was evident, which can be justified by the fact that the researchers are from this state and that the study was promoted through social media.

Contributions to the nursing, health, or public policy field

From the exposed results, the study may contribute to the knowledge about the difficulties faced by nursing professionals on the front line to combat the new coronavirus, as well as to bring the reality experienced by many nurses in Brazil, especially in the Northeast region, since the research had the majority professional involvement from five states in this region. In addition, it draws attention to the need for better working conditions for these professionals and the effective preventive measures implementation, starting with continuous and resolutive education.

CONCLUSION

In this study, we verified the predominance in those who had no training regarding COVID-19; and from those who did receive some type of training, almost half considered it insufficient. Moreover, it was verified that more than half of the sample mentioned COVID-19 cases in their workplace, besides the PPE shortage in the units where they work. These results demonstrate the need for hospital managers to incorporate better interventions regarding training, flux readjustment, and care facilities' physical structuring, as well as ensuring adequate PPEs to health professionals.

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