ORIGINAL ARTICLE

REVISTA ENFERMAGEM ATUAL IN DERME

USE OF PERSONAL PROTECTIVE EQUIPMENT IN COPING WITH THE COVID-19

USO DE EQUIPOS DE PROTECCIÓN PERSONAL EN EL ENFRENTAMIENTO DE LA COVID-19

USO DE EQUIPAMENTOS DE PROTEÇÃO INDIVIDUAL NO ENFRENTAMENTO À COVID-19

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ABSTRACT
Objective: To investigate the use of Personal Protective Equipment in the confrontation of Covid-19. **Methods:** Descriptive and quantitative study carried out through digital platforms, between August and October 2020. The collection was through a form with subsequent statistical analysis by Software R**. Results:** The sample contained 61 participants. There was a prevalence of people between 31 and 40 years old, with higher education and singles. Statistical analysis revealed ($p<0.05$) for the use of the equipment: cap, glove, facial protector, shoe, glasses and apron in the protection against Covid-19. Regarding their use, 57.4% of the professionals performed procedures without protection and for 55.7% the amount supplied was insufficient. **Conclusion:** Health professionals pointed out difficulties in the use of protective equipment, which increased the risk of contamination by Covid-19.
Keywords: Individual Protection Equipment; Coronavirus Infections; Health Personnel; Work Conditions; Occupational Health.

RESUMEN
Objetivo: Investigar el uso de Equipos de Protección Individual en la confrontación del Covid-19. **Métodos:** Estudio descriptivo y cuantitativo realizado a través de plataformas digitales, entre agosto y octubre de 2020. La recolección fue a través de un formulario con posterior análisis estadístico por *Software* R. **Resultados:** La muestra contó con 61 participantes. Hubo una prevalencia de personas entre 31 y 40 años, con educación superior y solteros. El análisis estadístico reveló ($p<0.05$) para el uso del equipo: gorra, guante, protector facial, zapato, gafas y delantal en la protección contra el Covid-19. En cuanto a su uso, el 57,4% de los profesionales realizó trámites sin protección y para el 55,7% la cantidad suministrada fue insuficiente. Además, el 80,3% reutilizó las inums en la pandemia, y el 13,1% se contaminó por Covid-19. **Conclusión:** Los profesionales de la salud señalaron dificultades en el uso de equipos de protección, lo que aumentó el riesgo de contaminación por Covid-19.
Palabras clave: Equipo de Protección Individual; Infecciones por Coronavirus; Personal Sanitario; Condiciones de Trabajo; Salud del Trabajador.

RESUMO
Objetivo: Investigar o uso de Equipamentos de Proteção Individual no enfrentamento à Covid-19. **Métodos:** Estudo descritivo e quantitativo realizado através de plataformas digitais, entre agosto e outubro de 2020. A coleta deu-se por meio de formulário com posterior análise estatística pelo *Software* R. **Resultados:** A amostra conteve 61 participantes. Houve prevalência de pessoas entre 31 a 40 anos, com nível superior e solteiros. A análise estatística revelou ($p<0.05$) para uso dos equipamentos: gorro, luva, protetor facial, sapato, óculos e avental na proteção contra a Covid-19. Quanto ao uso destes, 57,4% dos profissionais realizaram procedimentos sem proteção e para 55,7% a quantidade fornecida foi insuficiente. Ainda, 80,3% reutilizaram os insumos na pandemia, sendo que 13,1% se contaminaram pela Covid-19. **Conclusão:** Os profissionais de saúde apontaram dificuldades para uso de equipamentos de proteção, o que aumentou o risco de contaminação pela Covid-19.
Palavras-chave: Equipamento de Proteção Individual; Infecções por Coronavírus; Pessoal de Saúde; Condições de Trabalho; Saúde do Trabalhador.

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INTRODUCTION

Covid-19, a disease caused by SARS-CoV-2 infection, was first identified in December 2019 in Wuhan city, China, and has manifested itself as an acute respiratory syndrome of unknown etiology[1,2]. Thus, health services were essential, acting in prevention, diagnosis, treatment and rehabilitation in the face of pathology[3].

However, the numbers of hospitalizations for Covid-19 remain an international problem. The European Centre for Disease Prevention and Control linked to the European Union reported around 40,666,978 cases of covid-19 hospitalization in intensive care units (ICU) from December 2019 to September 2021[4]. Similarly, until September 2021, there were 3,996,797 people hospitalized in Brazil in severe condition due to the disease[5].

In this sense, health professionals working in the outpatient network, hospital or in basic health units are susceptible to Covid-19 infection, due to direct care to infected patients[6-7].

A study at the beginning of the pandemic revealed that the infection of health professionals by Covid-19 per country reached 17,306 cases and up to 605[8]. In China, there were 3,300 professionals infected and 23 deaths[9]. In Italy, 20% of the health professionals who contracted the infection died in a few weeks[10]. A Brazilian study revealed contamination of 15,332 health professionals between March and October 2020 and of these 97 deaths[11]. Until August 2021, the most affected category was the nursing class, with 58,000 cases and more than 866 deaths[12].

In order to reduce contamination, the National Health Surveillance Agency (ANVISA) published a Technical Note that provides for the mandatory use of Personal Protective Equipment (PPE) to assist suspected or confirmed cases of illness by Covid-19[13]. Among these, we highlight the surgical masks and respiratory protection N95/PFF2, disposable gloves, Face Shield, waterproof apron and cap[14-15].

The considered risk factors for Covid-19 infection include inadequate use of equipment, scarcity of PPE, work overload, inadequate hand hygiene, contact with infected patients and diagnosis of late Covid-19[9]. Given the scarcity of PPE in health services, the risk of illness for professionals in several countries is increased, with impacts and failures in care[16]. Thus, the availability and proper use of PPE becomes essential for the exercise of the profession and coping with the pandemic without transmission or contamination of the virus[8-17]. Thus, it is necessary to offer and use PPE for professionals, as well as wearing and taking them off training, which can impact on the reduction of contamination and death of this worker[6-7,18].

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Although its availability is recommended, there is difficulty in accessing PPE in the pandemic by Covid-19, due to the high demand[19]. From this perspective, the aim of this study is to investigate the use of PPE in coping with Covid-19.

METHODS

This is a descriptive, exploratory and quantitative study, developed through virtual means, with health professionals working in different health scenarios, from July to October 2020.

To select participants eligible for the study, the research was published in WhatsApp, Instagram and Facebook groups, through a private message inviting to participate in the study. A text with explanations of the research, the provision of a link with a Free and Informed Consent Form (TCLE) and access to the study form were inserted in these media. If the professional felt sensitized to participate, he/she could click on the link and answer the questions of the research. The professionals worked mainly in the urban area in public or private institutions where care is performed mainly by nurses.

The study had the inclusion criteria: individuals over 18 years of age, health professionals (higher, technical and middle level) active in the context of the pandemic by Covid-19 and belonging to the metropolitan region of Cariri, in southern Ceará, from the cities of Crato, Juazeiro do Norte and Barbalha. Those workers who were not classified as health professionals were excluded. It is emphasized that in Cariri there are about 8 professionals per thousand inhabitants and that the region has about 426,690 inhabitants. Some study workers were allocated to more than one care unit.

The instrument for data collection was built on the Google® Forms platform, consisting of 28 objective multiple choice questions, divided into two sections: the first one was about sociodemographic aspects (age, gender, time of education, degree of education, marital status and religion) and the second on access to and use of PPE by professionals in the workplace, pandemic, according to international recommendations[14]. The Revised Standards for Quality Improvement Reporting Excellence (SQUIRE 2.0) was adopted as a methodological security criterion for data protection. The form was self-applied and its completion was estimated around 10 minutes. The collection instrument remained open to answers for four months, and the collection was closed with 61 participants.

Then, the data was performed with absolute and relative frequency with the help of the Microsoft Excel for Windows 2016® program. The data were submitted to the normality test, with subsequent parametric statistical analysis with the Student's t-test for normal data and the Wilcoxon test for non-

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normal data by Software R, version 4.0.2 for Windows®. In all cases, the significance criteria of 5% were used.

The independent variables used were related to Personal Protective Equipment. The dependent variables and outcomes are related to questions about the supply of PPE, use of PPE, feeling of protection using the PPE provided, whether they have already attended patients with Covid-19, fear of being contaminated, personal purchase of PPE, feeling vulnerable and leaving to work because they lack PPE. The main outcomes analyzed were the risk of infection and contamination in the work environment from the statistical associations between the variables on the use of PPE and contamination in the work environment.

The research complies with Resolution n. 466 of December 12, 2012, of the National Health Council (NHC) which deals with research with human beings and was approved by the Research Ethics Committee (REC) under N. 4.120.399 and CAAE n. 33925320.7.0000.5055.

RESULTS

The research included 61 participants from the cities that make up the metropolitan region of Cariri, especially the municipality of Juazeiro do Norte (21, 34.4%) and Crato (12, 19.7%), who were in health work activities in coping with Covid-19. There was a prevalence of people between 31 and 40 years old, higher education (graduates) and with up to five years of education, female, brown color, single and professing the Catholic faith. Table 01 represents the sociodemographic profile of the participants.

Table 1 – Sociodemographic profile of survey participants, 2020.

	N	**f (%)**
Age		
18-25 years	16	26.2
26-30 years	08	13.1
31-40 years	23	37.7
41-50 years	11	18.0
51-60 years	03	5.0
Sex		
Female	43	70.5
Male	18	29.5
Time since graduation		
1-5 years	25	41
6-10 years	18	29.5
≥ 11 years	18	29.5
Educational degree		
High school	25	40

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College	05	8.2
Lato sensu specialization	27	45.2
MSc	02	3.3
PhD	02	3.3
Marital status		
Married	22	36
Stable	02	3.3
Dating	08	13.1
Separated	02	3.3
Single	27	44.3
Religion		
Catholic	49	80.4
Spiritist	05	8. 2
Evangelical	06	9. 8
None	01	1. 6

Source: created by the authors, 2021.

Regarding the profession, n=27 (44.3%) were nurses, n=09 (14.8%) were Community Health Agents (CHA), nursing technicians totaled n= 16 (26.3%) and n=03 (5%) were dentists. In addition to these, the research had a laboratory assistant, oral health technician, physician, physiotherapist, pharmacist and physical educator, with one participant each (1.6%). The main workplaces reported were: Basic Health Units (UBS) (n=23, 37.7%), general hospital (n=19, 31.1%) and reference hospitals for Covid-19 (n=11.18%).

The bivariate analysis of the t-test identified a value of (p=0.74), however the univariate revealed by the Wilcoxon method a significant statistic (p<0.05) for the questions about the protection of professionals and the use of PPE during performance in health services in the covid-19 pandemic, respectively, which are described in table 02. The analyses were made based on the association between the PPE used and the representativeness regarding the protection and/or risk of infection related to it.

Table 2 – Univariate analysis of survey data, 2020.

	N*	F(%)	Valor de p
Which PPE do you believe should be used to protect healthcare professionals to reduce the risk of Covid-19 infection?			*p=0.005*
Cap	58	95.0	
Glove	56	91.8	
Face shield	55	90.1	
Apron	54	88.5	
Glasses	54	88.5	
Closed shoe	54	88.5	
Surgical mask	46	75.4	

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Cloak	39	63.9	
Capote	38	62.2	
N95 Mask	16	26.2	
PFF2 Mask	05	8.10	
Fabric Mask	00	0	
Which PPE do you use to reduce the risk of infection by Covid-19?			*p=0.002*
Surgical mask	51	83.6	
Glove	48	78.6	
Apron	47	77.0	
Cap	46	75.4	
Closed shoe	46	75.4	
Face shield	39	63.9	
Glasses	38	62.2	
Propé	31	50.8	
Capote	22	36.0	
N95 Mask	10	16.3	
Pff2 Mask	05	8.10	
Fabric Mask†	04	6.60	

* More than one answer per participant. † Not considered PPE, but present in responses.
Source: created by the authors, 2021.

Regarding the questions that related to PPE, the participants answered 17 questions about the amount of PPE available in the services, supply, training, correct use, protection, dispersion of aerosols, taking off care, reuse of materials, acquisition of PPE, fear and contamination. Statistical analysis can be observed according to table 03.

Table 03 - Representation of research questions, 2020.

	Yes n(%)	**No n(%)**	**I don't know n(%)**	**I'd rather not to answer n(%)**	**p value**
Is there a sufficient amount of PPE in the unit where you work?	29 (47.5)	24 (39.3)	04 (6.6)	04(6.6)	*P=0.10*
Is there a sufficient supply of PPE by health management?	25 (41)	25 (41)	6 (9.8)	05 (8.2)	*P=0.09*
Have you received training in the correct use of personal protective equipment during the Covid-19 pandemic?	24 (39.3)	33 (54.2)	01 (1.6)	03 (4.9)	*P=0.14*
Do you feel protected using the PPE that are made available in your work?	18 (29.5)	38 (62.3)	02(3.3)	03 (4.9)	*P=0.16*
Have you ever performed procedures that predispose the patient to expel aerosols without the N95 mask?	20 (32.8)	40(65.6)	-	01 (1.6)	*P=0.20*
Have you ever treated a patient	35 (57.4)	22 (36.1)	03 (4.9)	01 (1.6)	*P=0.15*

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with Covid-19 without being properly dressed with all the necessary PPE?					
Is the amount of PPE made available by healthcare management compatible with the necessary exchange (always when changing patients or procedures)?	22 (36.1)	34 (55.7)	02 (3.3)	03 (4.9)	*P=0.14*
Have you ever bought PPE to use in your service in this pandemic period?	40 (65.6)	20 (32.8)	-	01 (1.6)	*P=0.20*
Have you ever been infected by Covid-19?	8 (13.1)	41 (67.2)	11 (18.1)	01 (1.6)	*P=0.18*
Has anyone on your team been infected by Covid-19?	50 (82)	08 (13.1)	02 (3.3)	01 (1.6)	*P=0.12*
If you believe that someone on your team has already been contaminated, do you believe that this contamination happened during your health work performed?	36 (59)	05 (8.2)	14 (23)	06 (9.8)	*P=0.12*
Do you know of someone in the health area close to you who has already been contaminated by Covid-19?	59 (96.8)	01 (1.6)	01 (1.6)	-	*P=0.37*
Have you ever lacked PPE at the institution where you work?	27 (44.3)	30 (49.1)	02 (3.3)	02 (3.3)	*P=0.14*
Is there control of dispensing/monitoring the use of PPE by health professionals, by management?	51 (83.6)	07 (11.5)	02 (3.3)	01 (1.6)	*P=0.12*
Are you afraid of contamination due to lack of PPE?	53 (86.9)	7 (11.5)	01 (1.6)	-	*P=0.18*
Have you ever stopped going to work due to the lack of PPE in this period of Covid-19?	55 (90.2)	05 (8.2)	-	01 (1.6)	*P=0.18*
Do you feel mentally vulnerable because you believe you are exposing yourself due to a lack of PPE or having them in low quantity or low quality?	46 (75.4)	12 (19.7)	02 (3.3)	01 (1.6)	*P=0.24*

Source: created by the authors, 2021.

It is emphasized that n=50 (82%) of the professionals state that co-workers have already been contaminated by Covid-19, of these n=36 (59%) believe that this contamination occurred in the work environment. When asked about the importance of receiving training for the use of PPE, n=59 (96.8%) expressed interest. About improvising some PPE during health care, n=30 (49.1%) reported the need to perform some adjustment for their or collective protection.

Of the interviewees, n=27 (44.2%) had already reused some protective equipment

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before the pandemic, n=49 (80.3%) had to reuse some PPE in the pandemic, n=61 (100%) believe that the lack of PPE increases the chances of contamination and n=53 (86.9%) are afraid of becoming contaminated.

The surveyed report that there is a lack of PPE at least once a month n=10 (16.3%) or once a week n=09 (14.7%). It is emphasized that the lack of PPE is more pronounced between 15 days (n=03, 4.9%) in Family Health Strategies (FHS), or even once a week (n=05, 8.2%).

DISCUSSION

The use of PPE is essential to ensure professional and hospital biosafety. Studies dealing with the control of Covid-19 infection reinforce preventive measures to reduce the risks of infection, especially the use of a cap, Masks N95/PPF2, gloves, goggles, protective clothing, disposable feet, disposable isolation aprons and facial shield by these professionals[9]. However, 57.4% of the professionals interviewed in this study have already treated patients with suspicion or confirmation of Covid-19 without being properly paraded.

PPE aligned with certificates of recommendation are sufficient to avoid contamination in up to 90% of cases; otherwise, they may expose risks to professionals[19]. Thus, the protection guaranteed by the PPE caused 65.6% of the professionals in this study to have already purchased due to insufficient supply.

The challenges faced by health professionals tend to increase with the lack of PPE with imminent risk of contamination[20]. Costs increased significantly after the pandemic, the unit value of surgical masks that went from 0.09 BRL to 2.60 BRL and N95/PFF2, which went from 1.45 BRL to 4.80 BRL, which overbilled the services[21]. This leads to saturation between supply and demand of PPE in the market.

The strategies to stop the price increase were the reduction of the supply of non-essential services, implementation of telecare and rationing of PPE consumption in the units[19], which was also observed in this study. Because it is an injury with dispensation of aerosols, the consumption of materials is high in the pandemic.

In this study, 32.8% of health professionals have already performed some procedure with dispensing of aerosols without the use of the N95 mask. The increase in the use of N95/PFF2 masks occurs mainly because if they were used only for procedures in isolation patients, now all professionals should use it throughout the care[21].

The use of N95 is indispensable to health professionals and its importance lies in minimizing infections[16]. In this study, it did not obtain a satisfactory percentage due to unavailability and greater use of surgical masks. Similarly, a study conducted in an

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ICU showed that only 15% of the professionals were totally protected, while the others carried only the N95 mask[22]. It is also emphasized that 44.3% of the professionals in this research reported the lack of other PPE in their services.

Still on the access of PPE, research in Italy showed that of 529 physicians who worked to cope with Covid-19, only 13% had access to PPE when they needed it[19]. In the on-screen study, it can be observed that the supply and access to PPE is not a characteristic, since most of them reported not having enough quantity, as well as, there is no adequate supply by health management, especially in basic health units.

Of the interviewees, 55.7% attest that management does not pass on the sufficient amount of PPE needed to perform the appropriate exchange. Thus, according to some codes of ethics of health professionals, workers may refuse to provide care in situations in which the service does not present safety conditions and is life-threatening[23].

In the case of the N95 mask, it is understood that the exchange within 12 hours may have contributed to the contamination of professionals[24]. In the on-screen study, 13.1% of the workers were contaminated by Covid-19, which may be related to several factors, such as the reuse of PPE and their lack in the workplace.

PPE function as essential barriers in standard precaution, by contact, droplet and aerosol; however, the worldwide recommendations on distance of one meter in the screening and the use of structures to separate patient and professional is still a standard to reach[13]. For strategic implementation, 96.8% of professionals agree that receiving training on the correct use of PPE can resolve harmful effects of care.

The ignorance about the correct practices of wearing and taking off can be considered a great risk for contamination of health professionals, since it is not uncommon to be exposure to patients, through stress and physical and emotional exhaustion, which can increase the risk of contamination[24]. In this context, many professionals did not receive adequate training to treat patients who were victims of Covid-19.

It is important to consider that the prolonged use of PPE impacts on basic physiological functions such as feeding, hydrating or even going to the bathroom, because the taking off process causes a risk of contamination and the over-practice of services generates time loss and increases contamination during care[23].

The notion of contamination in the work environment and the need for continuous use of PPE is also attested in this study, in which 13.1% of the interviewees had already become contaminated by Covid-19 during health care and 82% appointed team

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members with a history of contamination. Despite the protection, it is important to emphasize that the use of these materials leaves physical and psychological marks on workers. Facial protection masks, for example, have generated deep marks and/or lesions on the face of health professionals due to long times of use, and there is a need to stimulate skin cleansing and hydration, pressure relief and others[25].

As for the types of PPE made available and adopted, health services often adopt an autonomous way of managing the material. Therefore, in some cases, the use of caps, caps, hoods and overalls may not be observed[14]. Despite this reality, 95% of the professionals in this study agree that the cap should be used as PPE, as well as 63% of the bonnet.

The facial protector is pointed out as important by 63.9% of the participants in this study. This equipment, under dispensation of aerosols, can be beneficial in up to 98% of cases, both for the emitter and for the receiver of inhaled particles[26]. The reuse of PPE is a frequent practice in services[20]. In this study, 80.3% of professionals have already reused PPE in the pandemic, 100% of them are aware of the risk of contamination.

By putting themselves to work without inadequate conditions, professionals expose themselves to the virus and form a chain of transmission[23]. In this scenario, this study corroborates with professional practice and provides a strategic vision for health services regarding the use, access and use of PPE in Covid-19 with a reality applicable to different contexts of action. Thus, because it is an innovative research in this research theme, research can support the practice of multidisciplinary teams aiming at protection against Covid-19.

Despite important findings, the limitations found in the present study are related to the impossibility of generalizing the data found due to the amount of the sample and the urgency of themes focused on the subject. Furthermore, it is emphasized that the number of studies on the subject is insipid in the literature.

However, it is believed that a study can contribute to reflections on professional practice in times of pandemic, especially in the face of the adoption of PPE, questioning the performance of the services that provide health care and the role of management in the quality of care and protection of its professionals.

CONCLUSIONS

The professionals participating in the study point out difficulties in accessing PPE, which leads to unprotected work and contamination by Covid-19. It is emphasized that the purchase of PPE by workers and the reuse of materials constitute practices that put their health at risk. By exposing the needs inherent to professional health practice in

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times of pandemic, the possibility of subsequent studies that contribute to clinical practice opens up, providing changes in the structures of organization and management of resources that directly impact care, such as physical and human resources, increasing survival and reducing the physical and mental exhaustion of professionals.

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