









# Association of adherence and use of personal protective equipment with sick leave during the Covid-19 pandemic

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## ABSTRACT

**Objective:** Evaluate the association between adherence and the use of Personal Protective Equipment (PPE) with absence from work activities by Primary Health Care (PHC) workers and professionals linked to Health Residency Programs. **Methods:** This is of a cross-sectional, descriptive, and analytical study. Data collection took place in Brazil, between August/2020 and March/2021. The sample was composed of all PHC workers listed in the National Council of Health Establishments (CNES) and professionals linked to Health Residency Programs. The validated self-administered questionnaire made available in a virtual environment by the free platform KoBoToolbox (<https://www.kobotoolbox.org/>) was used. For analysis, descriptive and inferential statistics were employed. The research was approved by the Human Research Ethics Committee under opinion No. 5,429,839. **Results:** 682 health workers participated in the study, 455 (66.7%) were from PHC and 227 (33.3%) were residency professionals. Of these, 62.4% PHC workers and 62.9% residency professionals were on leave of absence from their work activities due to suspicion of Covid-19. While 27.4% of PHC workers and 33.3% of residency professionals were laid off due to a diagnosis of Covid-19. PHC and residency workers who properly used goggles/face shield PPE had, respectively, 0.74 and 0.66 times lower prevalence of absence from work activities compared to those who did not use it properly. **Conclusion:** Leave of absence is associated with adherence and adequate use of PPE goggles/face shields among PHC workers and professionals linked to Health Residency Programs.

**Keywords:** Personal protective equipment, Sick leave, Health professionals, Primary health care, Covid-19.

## INTRODUCTION

The Covid-19 pandemic spread quickly and triggered numerous challenges for the countries<sup>1-2</sup>, affecting the lives of health workers, especially those who started to use measures of contamination prevention and control in addition to those already used in their daily lives<sup>3</sup>. Among these, we have Primary Health Care (PHC) workers who play a pivotal role in the battle against Covid-19, as it is one of the gateways to the Unified Health System (SUS)<sup>4</sup>. In this con-

text, the relevance of professionals linked to Health Residency Programs who work in Health Care Networks (RAS)<sup>5</sup> is also highlighted. Consequently, these individuals constitute a risk group due to their frequent exposure to elevated viral loads<sup>6-8</sup>.

In response to this context, security measures were reinforced, such as the use of Personal Protective Equipment (PPE)<sup>8-9</sup>. Nevertheless, the risk of infection escalates when PPE is reused or improperly employed<sup>9</sup>. A study carried out in Brazil found that 50.1% of workers reported a shortage

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of essential PPE at the institution, such as N95 and surgical masks, aprons, and goggles/face shields. Notably, 44.3% of these were infected with the inadequacy of PPE emerging as a significant contributing factor<sup>10</sup>. It is imperative for professionals operating in such environments to understand the correct usage of PPE and adopt preventive measures in combating Covid-19<sup>11</sup>.

During the pandemic, a substantial number of healthcare workers were infected by Covid-19<sup>12</sup>, with the risk of contracting the virus found to be up to ten times greater than that of the general population<sup>9</sup>. A study carried out in Qatar showed that Covid-19 infection among healthcare workers occurs more frequently among those workers who do not provide direct assistance to patients infected by Covid-19, as there is a lower rate of adherence to PPE in non-Covid-19 service facilities<sup>13</sup>.

In addition to the usual absences due to medical certificates, declarations and medical leave during the pandemic, a new type of absence from work was registered related to the risk of viral transmission by symptomatic workers.<sup>14</sup> In other words, professionals who presented one or more symptoms suggestive of viral contamination by Covid-19, such as fever, cough, dyspnea, myalgia, fatigue, loss of smell and taste, were on sick leave<sup>14</sup>. Even without laboratory confirmation of the disease, the suspicion of contagion corresponded to the need to be on sick leave. However, throughout the pandemic, the guidelines were changed through service instructions based on municipal, state, and federal decrees<sup>15</sup>.

The rationale for this study is the impact that Covid-19 has on the daily work of PHC workers; the increase in the number of workers infected by the virus<sup>12</sup>; the recom-

mendation that the use of PPE is the main preventive measure to ensure the protection of workers<sup>8</sup> and the evidence that factors such as lack of PPE, non-adherence, inappropriate use and reuse of PPE are related to the worker's risk of developing this and other Healthcare-Associated Infections (HAIs)<sup>6-9</sup>.

In light of these considerations, the research hypothesis is that there is an association between absence due to the diagnosis of Covid-19 of PHC workers and professionals linked to Health Residency Programs, related to non-adherence and inadequate use of PPE. Therefore, the study aims to evaluate the association between adherence to PPE protocols and sick leave among PHC workers and Health Residency Programs professionals.

## METHODS

### Type of study

This is a cross-sectional, descriptive, and analytical study carried out in Brazil. The study is part of the "PPE Covid19 Brazil" project and was guided by the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) and Checklist for Reporting Results of Internet E-Surveys (CHERRIES).

### Population

The population included in the study was made up of all PHC workers listed in the National Council of Health Establishments (CNES) (nurse, doctor, physiotherapist, speech therapist, dental surgeon, nutritionist, pharmacist, psychologist, social worker, nursing technician, assistant nursing staff, community agent, oral health

agent, oral health technician, administrative technical assistant, and receptionist), in addition to all professionals linked to the Health Residency Programs (doctor, nurses, physiotherapist, dental surgeon, speech therapist, social worker, psychologist, nutritionist and pharmacist). Preceptors in Health Residency Programs were excluded from the study. Therefore, participants who agreed to participate in the research voluntarily constituted the convenience sample.

## Data collection

Data collection took place from August 2020 to March 2021. A validated, self-administered questionnaire elaborated by researchers<sup>16</sup> was used to collect data from PHC workers and its version was adapted for professionals linked to Residency Programs. The questionnaire was made available virtually in the free platform KoBoToolbox (<https://www.kobotoolbox.org/>). It included questions relating to the characterization of the participant, the appropriate use of PPE and the use of PPE in daily work, and the questions were directed to the professional class informed by the participant.

The research was disseminated via telephone, email, the research website (<https://www.ufjf.br/epicovid19/>), social networks Instagram® (@epicovidufjf, @epicovidufjf2), Facebook® (E.P.I Covid19 Brazil) and WhatsApp®<sup>17</sup>.

Questions regarding adherence and use of PPE were answered using a four-point Likert scale: “never”, “rarely”, “almost always” and “always”. For evaluation, the answers were recoded in a dichotomous way and then scored, with “no” (0 points) for “never”, “rarely”, “almost always”, and “yes” (1 point) for “always”. It is important to highlight that the instrument contains questions about the reu-

se of PPE, in this case the score was reversed, no (1 point) and yes (0 point).

To analyze the appropriate use of PPE, it was considered that professionals use PPE suitably when they reach the total score in each domain. In order to measure adherence to the use of PPE, an individual calculation was carried out (number of domains that showed adequate use/total number of domains answered x 100). Regarding adherence to the use of PPE, the score adopted was greater than and/or equal to 75%<sup>18-19</sup>.

## Data analysis

The data collected on the KoboToolbox platform was exported to a Microsoft Office Excel spreadsheet to assess the bank’s consistency and organization. Data processing and analysis were carried out using the Statistical Package for the Social Sciences v.21 for Windows software.

The independent variables were professional employment, adequate use of PPE and adherence and the dependent variable was absence from work activities.

The Kolmogorov-Smirnov normality test and descriptive statistics were performed through the analysis of relative frequencies, measures of central tendency (mean, median) and measures of dispersion (standard deviation and interquartile range).

The association between adherence and absence from work activities of health workers was analyzed using the Mann-Whitney Test. To analyze the association between the other dependent variables and absence from work activities, the Chi-Square or Fisher’s exact test was used. The prevalences related to absence were estimated with a 95% Confidence Interval (95% CI).

## Ethical aspects

The research was approved by the Human Research Ethics Committee under opinion No. 5,429,839 and CAAE No. 30933220.7.0000.5147 following Resolution 466/12. All participants signed the Free and Informed Consent Form (TCLE).

## RESULTS

A total of 682 health workers participated in the study, including 455 (66.7%) from PHC and 227 (33.3%) linked to Health Residency Programs. The average age was 37.3 years (SD= 8.9) for PHC workers and 27.9 (SD= 62.6%) for those linked to Residency Programs. Regarding gender,

what stood out were cis women with 549 (80.5%). Furthermore, most research participants reported being without a partner (373; 54.7%) and it was identified that the majority of participants were from the southeast region of the country (445; 65.2%).

Table 1 presents the characterization regarding the absence of PHC workers and professionals linked to Health Residency Programs. It was observed that 123 PHC workers (62.4%) and 66 (62.9%) of professionals linked to residency reported having been removed with suspicion of Covid-19. It is also worth noting that the absence rate due to the diagnosis of Covid-19 among PHC workers was 27.4% and 33.3% among residency professionals.

Sick Leave		Professional Relationship of the Participant	
		PHC n (%)	Residency n (%)
Leave from activities	Yes	197(43.3)	105(46.3)
	No	258(56.7)	122(53.7)
Leave due to suspicion of Covid-19	Yes	123(62.4)	66(62.9)
	No	74(37.6)	39(37.1)
Leave due to Covid-19 diagnosis	Yes	54(27.4)	35(33.3)
	No	143(72.6)	70(66.7)
Leave due to risk group	Yes	15(7.6)	4(3.8)
	No	182(92.4)	101(96.2)
Leave due to other reasons	Yes	22(11.2)	13(12.4)
	No	175(88.8)	92(87.6)

**Table 1** – Characterization related to the absence of PHC workers and professionals linked to Health Residency Programs. Brazil, 2021 (n = 682).

Source: Elaborated by the authors

Table 2 illustrates the correlation between the proper utilization of Personal Protective Equipment (PPE) and sick leave among Primary Healthcare (PHC) employees. The findings indicate that PHC workers who appropriately use goggles/shield PPE are 0.74 times more likely to take sick leave from work activities compared to those who do not use them appropriately.

**Table 2** - Suitable use of PPE stratified by absence from work activities by PHC workers. Brazil, 2021 (n = 455).

Suitable use of PPE		Sick Leave		RP (IC 95%)	*p-value
		Yes (%)	No (%)		
Scrub Cap	Yes	13 (33.3)	26 (66.7)	0.78	0.27
	No	111 (42.5)	150 (57.5)	(0.492-1.249)	
Gloves	Yes	52 (42.3)	71 (57.7)	1.03	0.78
	No	72 (40.7)	105 (59.3)	(0.791-1.365)	
Safety Behavior	Yes	24 (43.6)	31 (65.4)	1.00	0.95
	No	173 (43.2)	227 (56.8)	(0.732-1.390)	
N95 Mask	Yes	51 (42.9)	68 (57.1)	0.92	0.58
	No	47 (46.5)	54 (53.1)	(0.686-1.236)	
Hand Hygiene	Yes	93 (41.5)	131 (58.5)	0.92	0.45
	No	104 (45.0)	127 (55.0)	(0.747-1.139)	
Apron/Coat	Yes	39 (39.7)	64 (62.1)	0.84	0.28
	No	63 (44.7)	78 (55.3)	(0.623-1.153)	
Surgical Mask	Yes	41 (41.0)	59 (59.0)	0.95	0.70
	No	123 (43.2)	162 (56.8)	(0.725-1.245)	
Goggles/Face Shield	Yes	59 (35.5)	107 (64.5)	0.742	<b>0.05</b>
	No	45 (47.9)	49 (52.1)	(0.553-0.996)	

\*Chi-Square Test

Source: Elaborated by the authors

Table 3 shows that among professionals associated with Health Residency Programs, those who correctly use PPE goggles/face shields exhibit a 0.66 times lower prevalence of absenteeism from work activities in comparison to their counterparts who do not use them appropriately.

**Table 3** - Suitable use of PPE stratified by absence from work activities by professionals linked to Health Residency Programs. Brazil, 2021 (n = 277).

Suitable use of PPE		Sick leave		RP (IC 95%)	*p-value
		Yes (%)	No (%)		
Scrub Cap	Yes	9 (50.0)	9 (50.0)	1.08	0.76
	No	55 (46.2)	64 (53.8)	(0.656-1.785)	
Gloves	Yes	6 (42.9)	8 (57.1)	0.94	0.86
	No	61 (45.2)	74 (54.8)	(0.504-1.786)	
Safety Behavior	Yes	0 (0.0)	3 (100.0)	1.88	0.25
	No	105 (46.9)	119 (53.1)	(1.664-2.129)	
N95 Mask	Yes	29 (42.6)	39 (57.4)	0.85	0.39
	No	32 (50.0)	32 (50.0)	(0.590-1.233)	
Hand Hygiene	Yes	39 (45.9)	46 (54.1)	0.98	0.93
	No	66 (46.5)	76 (53.5)	(0.738-1.320)	
Apron/Coat	Yes	21 (47.7)	23 (52.3)	0.94	0.75
	No	36 (50.7)	35 (49.3)	(0.641-1.383)	
Surgical Mask	Yes	50 (45.5)	60 (54.5)	1.01	0.93
	No	39 (44.8)	48 (55.2)	(0.744-1.383)	
Goggles/Face Shield	Yes	22 (39.3)	34 (60.7)	0.66	<b>0.03</b>
	No	32 (59.3)	22 (40.7)	(0.447-0.983)	

\*Chi-Square Test

Source: Elaborated by the authors

The association analysis demonstrates that adherence to PPE by PHC workers and professionals linked to Residency Programs influences sick leave ( $p \leq 0.04$ ), so that health workers who showed adherence to the appropriate use of PPE had less absence from work activities.

work leave by PHC workers and professionals linked to Health Residency Programs. The findings showed that sick leave was related to adherence and associated with adequate use of goggles/face shield PPE among PHC workers and professionals linked to Health Residency Programs.

## DISCUSSION

This study examined the correlation between adherence and use of PPE and

The PHC workers in this study reported 62.4% of work leave due to suspicion and 27.4% due to a diagnosis of Covid-19; whereas resident professionals presented 62.9% and 33.3%, respectively. According

to literature data, this population represents 3.8% to 20% of the infected population<sup>20</sup>. Therefore, the professional categories that present the highest contamination rates are nursing technicians/assistants (22.4%), doctors (18.1%) and nurses (8.9%)<sup>21</sup>. And even though, among 380 cases reported among health professionals, 23.2% resulted in death, being 83.0% due to Covid-19<sup>21</sup>.

Regarding the appropriate use of PPE, it is worth highlighting that goggles/face shields were associated with absence of health workers in both groups of this study. Such evidence can be justified due to the importance of this PPE for the protection of workers during direct assistance procedures, when there is a risk of exposure to blood, excretions and secretions<sup>22</sup>. The use of a face shield works as a facial protection barrier that, in addition to protecting the professional's face, prevents contamination of other PPE such as masks<sup>23-24</sup>. However, it is important to highlight that the use of a face shield does not eliminate the need to use other PPE to guarantee effectiveness in protecting the professional<sup>24</sup>.

Regarding PPE masks, it is known that the N95 mask provides greater protection to workers compared to the surgical mask<sup>25</sup>. In the present study, the use of the N95 mask and not taking time off from work activities was greater among residents (57.4%) while, among PHC workers, the greatest use was of the surgical mask (59.0%). Our findings bring to light a concerning pattern wherein workers abstain from using N95 masks due to prolonged intervals between distributions<sup>7</sup>. Added to this is the fact that these professionals reuse the mask after washing and applying alcohol 70%, compromising its effectiveness and increasing the risk of aerosol contamination<sup>7</sup>.

A study shows that the use of an apron/coat prevents contamination of surfaces such as the professional's clothes and skin during patient care<sup>22</sup>. From this perspective, workers who use an apron/coat have a lower risk of becoming contaminated. Furthermore, preserving the integrity of the PPE during degowning minimizes the risk of contamination with secretions present on the clothing<sup>25</sup>. The findings of this research show that 62.1% of PHC workers who used this equipment were not absent from their activities, as were residents (52.3%).

The use of a scrub cap is related to protecting the head and hair of healthcare professionals during procedures, especially those that can generate aerosols<sup>21-26</sup>. The findings of the present study show that 66.7% of PHC and 50.0% of residents used this PPE and were not absent from their activities. However, around 57.4% professionals have already treated patients with suspected or confirmed Covid-19 without being properly attired<sup>26</sup>.

Studies indicate that gloves, in turn, should be used in various patient care activities, as they help prevent infections among healthcare professionals, in addition to reducing the transmission of infections<sup>21,26,27</sup>. It is worth highlighting that the effectiveness of using this and other PPEs is associated with adherence to correct hand hygiene before and after contact with the patient<sup>27</sup>. In the present research, hand hygiene was higher among PHC workers (58.5%), whereas the use of gloves was higher among residents (57.1%) when associated with not being on a sick leave. Hand hygiene is one of the most efficient methods for preventing infections<sup>28</sup>. Therefore, it is essential to continuously adopt this measure and educational actions that

encourage knowledge of the appropriate technique, promoting safety behaviors<sup>28</sup>.

Among safety behavior measures in the workplace, biosafety precautions are fundamental regarding health promotion and prevention of physical, biological, chemical, and ergonomic risks<sup>15</sup>. Adherence to the use of PPE is related to professionals' perception regarding exposure to occupational risks, which in addition to affecting work activities, can interfere with the professional's psychosocial aspects<sup>15</sup>.

In the pandemic context, the intensification of the work of health professionals became evident<sup>29</sup>. Although studies emphasize the importance of precaution using PPE, these recommendations were made difficult at the beginning of the pandemic, due to the difficulty in satisfactorily offering these devices<sup>6,29-31</sup>. Added to this is the physical and mental exhaustion experienced by health professionals<sup>32</sup>. The use of PPE is essential to protect professionals; however, the study highlights low adherence to the use of PPE, corroborating other studies in which low adherence to equipment directly impacts worker health, increasing their exposure to the risk of contamination by Covid-19<sup>28-34</sup>.

Regarding the sick leave of workers who show signs and symptoms suspected of Covid-19, they must be on a leave immediately and subsequently carry out RT-PCR tests with a detectable result or Rapid Antigen Test with a reactive result. If the suspicion is confirmed, quarantine and monitoring of signs and symptoms must be carried out<sup>21</sup>. In the present study, it was possible to observe that absence due to suspicion of Covid-19 was higher in both groups compared to absence due to diagnosis.

Regarding whether or not they belong to the risk group for Covid-19, a study carried out with nurses in Brazil shows that around 74.4% of nursing professionals in Brazil did not belong to the risk group<sup>8</sup>. Corroborating the results of the present study in which 92.4% of PHC workers and 96.2% of professionals linked to health Residency Programs are also not part of the risk group for Covid-19.

This study has some limitations such as those inherent to the cross-sectional study, such as the cause-and-effect relationship on the results found and the impossibility of inferences about the temporal accomplishment of the events. The low participation of health professionals can be justified due to the data collection being carried out online, contributing to a greater distance between researchers and participants, in addition to the overload of participants' work activities during the data collection period. And finally, the highest concentration of participants in the southeast region, which may be related to the fact that this region has the largest number of health professionals<sup>35-37</sup> and that the research team was located in this region. Furthermore, in the last month of data collection there was an intensification of dissemination in the state of Minas Gerais.

The findings of this study, however, present relevant elements regarding the absence of professionals working in the health sector in the context of the Covid-19 pandemic. The sick leave of these professionals from their work activities generates an impact on their individual nature and on their mental health with the prevalence of symptoms of stress, anxiety and depression due to fears, uncertainties and insecurities<sup>25</sup>, and impacts on the health system in addition to enabling

work overload<sup>12</sup>. Knowing the points that favor this absence, such as the lack of PPE and their inappropriate use, promotes awareness regarding the importance of adherence and their correct use.

## CONCLUSION

It is concluded that absence from work activities is associated with adherence and use of PPE goggles/face shields among PHC workers and professionals linked to Health Residency Programs. The prevalence of sick leave due to the diagnosis of Covid-19 among PHC workers was 27.4% and among workers linked to the residency, 33.3%. It is also worth noting that 62.4% of PHC workers and 62.9% of residential professionals were on sick leave due to suspicion of Covid-19.

It is expected that the results will enable better investments in the health sector and provide educational actions regarding adherence and adequate use of PPE. It is hoped that the data presented will encourage the development of further studies to investigate the damage caused by absence to professionals and the health service and, thus, create effective and assertive strategies concerning the preventive process and the return of these professionals to their work.

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