A Questionnaire Survey of Personal and Occupational Variables Associated With SARS-COV-2 Infection in Health Care Personnel of the Spanish Central Military Hospital

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ABSTRACT

Introduction:

Spain is the country with the highest number of health care workers affected by coronavirus disease 2019 (COVID-19) in the world. The aim of this study was to describe the epidemiology of severe acute respiratory syndrome coronavirus 2 (SARS-COV-2) infection in health care worker (HCW) at the Gómez Ulla Military Hospital (HCDGU).

Materials and Methods:

A case-control study was conducted during the first outbreak of COVID 19 at GUMH. The study was extended to the total number of HCW in the hospital who met the inclusion criteria. Health care worker of the HCDGU were civilian and military personnel that included nursing and medicine students of Spanish Military Academy, medicine specialty residents, and nursing residents of Medical Surgical Specialty in Operations (EMQO). A questionnaire of 33 items was prepared. The questionnaire was sent by e-mail to the entire population of study. With this questionnaire personnel were classified into sick (cases) or healthy.

Results and Conclusions:

One hundred fifty professionals answered the questionnaire. Cases were defined as those who tested positive in the diagnostic tests ($n = 28$, 20.7%) and no cases were those who tested negative ($n = 107$, 79.3%). Therefore, the percentage of SARS-CoV-2 in the GUMH was 20.7%. Of the total number of cases, 64.3% were men ($P < .05$), with a mean age of 47.1 years (SD 13.3), a mean BMI of 25.3 (SD 3.8), and 48.2% being overweight. Of the total cases, 59.3% had "A" blood group type and 69.2% were Rh positive. 50% were physicians, 32.1% were nurses, and 17.9% were auxiliary nurses ($P < .05$). Cases and controls with vitamin D deficiency and who took supplements had a lower risk of suffering COVID-19, with significant differences. Fever, cough, and diarrhea were found in at least 50% of the samples with significant differences.

INTRODUCTION

Spain is the country in the world with the highest number of health care workers (HCWs) affected by coronavirus disease 2019 (COVID-19) disease.[1] A report by the European Centre for Disease Control and Prevention (ECDC) highlights that 20% of COVID-19 in Spain affects this group, while in Italy this percentage is reduced to 10%, and in the USA and China to 3% and 3.8%, respectively.[2,3] Up to May 21, 2020, a total of 250,287 cases of COVID-19 were reported in Spain to the National Epidemiological Surveillance Network, of which 40,921 cases correspond to HCW.[4]

In order to reduce morbidity and mortality among these personnel, it is necessary to adopt primary preventive measures. If the causes were known, it would be possible to contribute to the design, development and implementation of public health measures with which to respond effectively to the ongoing severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) epidemic. The main objective of this study was to determine the epidemiology of SARS-COV-2 infection in health care personnel at the Hospital Militar Central de la Defensa Gómez Ulla (HCDGU).

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The views expressed are solely those of the authors and do not reflect the official policy or position of the Spanish Armed Forces or the Spanish Government.

doi:https://doi.org/10.1093/milmed/usab366

The specific objectives were:

- to describe the prevalence of COVID-19 infection in health care personnel at the beginning of the study,
- to analyze the probability of exposure to different risk factors in cases,
- to detail the signs and symptoms presented by the cases, and
- to analyze which factors influenced the appearance of signs and symptoms.

METHODS

Design, Setting, and Participants

A study was conducted during the first outbreak of COVID-19 at the HCDGU, from June to October 2020.

The total study population was 1,171 health care professionals working in that hospital. No sampling was performed and was extended to the total number of individuals who met the inclusion criteria. Included, HCWs from the HCDGU, civilian and military administration, nursing students of the Central Defense Academy, who although not career military had entered with previous qualifications, and were graduates in Nursing, all students of the Central Defense Academy who entered with a degree in Medicine and those who, although they are pursuing a degree in Medicine, are graduates in Nursing, resident medical interns of any specialty belonging to the military or civilian administration and nurse intern residents of the Medical Surgical Specialty in Operations (EMQO).

Study Variables

The following variables were chosen because numerous studies have found an association between these variables and the disease in the general population.[5–7]

These variables were divided into three subgroups:

1. Personal factors: age, sex, height, weight; body mass index (BMI) was calculated as weight (kg)/height^2 (m^2); blood group; blood Rh; tobacco use (yes, no, ex-smoker); alcohol consumption (never drank, less than once a week, drink at least once a week); suffer from chronic diseases (high blood pressure, diabetes, heart disease, chronic obstructive pulmonary disease, asthma, malignant tumors or other chronic disease), physical activity, vitamin D deficiency, vitamin D supplementation, measurement of stress and distress in professionals through the Perceived Stress Scale, in its validated Spanish version, reduced 4-item version
2. Occupational factors: type of health care professional; physician or nurse specialty if they had; civilian or military personnel; years of experience (coded as <10 years, 10-20 years, and >20 years); field of work (hospital emergency, emergency areas enabled for this purpose, intensive care, hospitalization, other), having received the seasonal flu vaccine in 2019-2020; currently working; to have been tested for COVID-19; type of COVID-19 test (polymerase chain reaction, rapid antigen test); test result (positive, negative); to be daily exposed to COVID-19 patients (yes, little exposure, no exposure); average time of exposure to COVID patients, per shift (<5 hours, 5-8 hours, >5 hours); work shifts performed (morning shift, afternoon shift, night shift, 24-hour shifts, 12-hour shifts, back-up); number of hours of daily work;[8,9] days off weekly in the period of COVID-19 care (0, 1, 2, more than 2); extent to which you have received adequate training in handling personal protective equipment (PPE) (a lot, a lot, a little, not at all); PPE removal training (always, often, occasionally, rarely, hardly ever, never); to keep the removal steps safely (always, often, occasionally, hardly ever, never); whenever left a more contaminated room or area, to remove the outermost layer of PPE (always, often, occasionally, rarely, almost never, never); amount of protective material (a lot, quite enough, little, none); adequate material; to re-use the material; if re-used material, to indicate which (gloves, mask, impervious gown, tights, hat, protective screen, goggles).
3. Clinical illness: COVID-19 signs and symptoms currently present (fever, sore throat, pneumonia, cough, headache, diarrhea, respiratory distress, and other respiratory signs).

After reviewing the literature, we did not find any measurement instrument already used and validated that could be used in this study. For this reason, based on the variables of other questionnaires and the evidence found, a 33-item questionnaire was developed. It was validated with the first 20% of the sample. A mass mailing was made to all Military Health Corps personnel who met the inclusion criteria. It was sent to all the mails belonging to the Ministry of Defense. This mailing was sent again a week after the first mailing, and a third mailing was sent a week later. The responses were then included in an excel spreadsheet where they were separated from any data that could identify such personnel. This initial questionnaire made it possible to divide the personnel into sick or healthy.

Ethical Aspects

All individuals received an initial section in the questionnaire in which they were informed in detail of the details of the study, objectives, and other aspects of interest. Likewise, this project was evaluated and approved by the Research Ethics Committee of the Hospital Central de la Defensa Gómez Ulla. All data were treated according to the Organic Law 3/2018, of December 5, on Data Protection and Guarantee of Digital Rights (LOPDGDD) and subsequent amendments, as well as the Declaration of Helsinki of the World Medical Association, on ethical principles for medical research on human beings and finally the Law 41/2002, of November 14, basic regulating patient autonomy and rights and obligations regarding information and clinical documentation.

Statistical Analysis

Percentage and prevalence calculations were performed to describe the sample. To evaluate which variables followed a normal distribution, the Kolmogorov-Smirnof test was performed. To evaluate the existence of a statistically significant association ($P < .05$) of the dependent variable with each of the possible independent variables, a bivariate analysis was performed using the Chi-square test (qualitative variables) and Student's t test (quantitative variables).

To evaluate the independent association of the factors studied with the disease, odds ratios (OR) with their 95% CIs were calculated using logistic regression models. The models were adjusted for the confounding variables that were considered appropriate, and the existence of interaction between them was evaluated.

Statistical processing of the data was carried out using SPSS (Statistical Package for Social Sciences) V25.0 for Windows.

RESULTS

Study Population

Relative to study population, out of the 1.171 health professionals who made up the initial population, 703 (62.0%) were women, had a mean age of 48.7 years, 577 (49.3%) were nurses, 365 (31.2%) physicians, and 229 (19.5%) nursing assistants.

Only 150 professionals answered the questionnaire. A total of 56.2% were women, with a mean age of 46.7 years (SD 13.4). Of the total, 47.6% were nurses, 29.6% were physicians, and 27.3% were auxiliary nurses. 63.2% with 10 years of experience and 66.4% belonging to the military administration. Some 36.7% stated that their field of work was intensive care, 35.9% hospitalization service, and 32.0% the emergency room. 62.5% were aged 50 years or over with a mean BMI of 24.9 kg/m^2 (SD 3.9) and 61.7% being normal weight. The 47.7% reported having blood group "A" and 77.3%, Rh positive. The results presented in this study refer to the personnel who answered to the questionnaire (Table I).

Of the 150 professionals who answered the questionnaire, 15 did not undergo any diagnostic test, so they could not be classified as cases. Cases were defined as those who tested positive in the diagnostic tests ($n = 28$, 20.7%), and the rest were those who tested negative ($n = 107$, 79.3%). Therefore, the proportion of SARS-CoV-2 in the GUMH was 20.7%. Of the total number of cases, 64.3% were men ($P < .05$), 50% were physicians, 32.1% were nurses, and 17.9% were auxiliary nurses ($P < .05$). Likewise, 72.8% did not present vitamin D deficiency ($P < .05$) and 75.0% did not take vitamin D supplements ($P < .05$). In addition, the mean stress among the cases was 2.86 (2.1) ($P < .05$) and only 10.7% reported feeling a medium level of stress (Table I).

Probability of Exposure to Different Risk Factors in Cases versus Not Cases

In relation to the factors of direct exposure to COVID-19, which could have influenced transmission, 82.1% of the cases reported having been exposed to COVID-19 patients and 77.8% of the cases worked during the morning shift ($P < .05$), with a mean daily working hours of 8.6 (SD 1.0) and a mean number of days off work of 1.25 (SD 0.7). 25.0% of the cases reported having safely followed the steps for PPE removal compared to 33.3% who did not, finding a statistically significant association ($P = .009$) (Table II).

Signs and Symptoms Presented by the Cases and Which Factors Influenced the Appearance of Them

In relation to the most frequent signs and symptoms, 60.7% of the cases presented fever, 50.0% cough and diarrhea and 46.4% headache. Only 14.3% of the cases presented pneumonia and respiratory distress, with significance found when they presented fever, sore throat, pneumonia, cough, diarrhea, and other respiratory signs. Differences were also found in relation to fever and sex, being higher in men (88.2%) than in women (11.8%), in those who presented chronic comorbidities (58.8%) versus those who did not (41.2%), as well as in those who reported not having vitamin D deficiency (57.1%) versus those who did (42.9%) ($P < .05$). A statistically significant association was found between sore throat and those who did not receive the flu vaccine (54.5%) versus those who did (45.5%) ($P < .05$). Differences were also found between cases with pneumonia and overweight (100.0%), blood group "O" (50.0%), and those who did not perform physical activity (75.0%). Cough was associated with those cases with 10 years or more of experience (61.5%). On the other hand, those cases that presented diarrhea were associated with not taking vitamin D supplements (57.1%) ($P < .05$) and cases with respiratory distress were more numerous among those with blood group "0" (75.0%) ($P < .05$). In addition, women presented other respiratory signs in a higher percentage (75%) than men (25%), with a significant association ($P < .05$).

DISCUSSION

Percentage of COVID-19 Infection in Health Care Personnel at the Beginning of the Study

The initial population consisted of 1.171 health professionals, of whom 703 (62.0%) were women, with a mean age of 48.7 years, and of the total number of professionals, 577 (49.3%) were nurses, 365 (31.2%) physicians, and 229 (19.5%) nursing assistants.

The response rate was 12.8%, which is lower than that of other studies carried out, where the percentage ranged from 86.7% (only 83 individuals were sent the questionnaire)[5] to 73.8%.[6] The low participation of health care professionals in the study may have been because of the fact that they had little free time and used it to rest or spend with their families or to

TABLE I. Sample Characteristics, Percentage, and Factors Associated with COVID-19

	Total *n* (%)	Cases *n* (%)	IC 95%	No cases *n* (%)	IC 95%	*P*-value	OR (IC 95%)
Sex ($n = 132$)							
Man	60 (45.5)	18 (64.3)	(56.6-72.0)	42 (40.4)	(32.5-48.3)	.024*	3.2 (1.1-8.6)***
Woman	72 (54.5)	10 (35.7)	(28.0-43.4)	62 (59.6)	(51.1-67.5)		
Age ($n = 150$)							
M (DT)	46.7 (13.4)	47.1 (13.3)	(7.9-18.9)	44.1 (14.4)	(8.8-20.0)	.332**	1.0 (1.0-1.1)***
Age intervals ($n = 128$)							
≤50 years	80 (62.5)	14 (50.0)	(42.0-58.8)	66(66.0)	(58.4-73.6)	.122*	
>50 years	48 (37.5)	14 (50.0)	(42.0-58.8)	34(34.0)	(26.4-41.6)		
BMI							
M (DT)	24.9 (3.9)	25.3 (3.8)	(0.7-6.9)	24.2 (3.7)	(0.7-6.7)	.181**	
Weight interpretation of the BMI ($n = 130$)							
Normal weight	79 (60.8)	14 (51.8)	(43.2-60.4)	65 (63.1)	(54.8-71.4)	.286*	
Excess weight (everweight/obesity)	51 (39.2)	13 (48.2)	(39.6-56.8)	38 (36.9)	(28.6-45.2)		
Blood group ($n = 126$)							
O	39 (30.9)	7 (25.9)	(18.9-32.9)	32 (32.3)	(24.8-39.8)	.129*	
A	61 (48.4)	16 (59.3)	(51.4-67.2)	45 (45.5)	(37.5-53.5)		
B	18 (14.3)	4 (14.8)	(9.1-20.5)	14 (14.1)	(8.5-19.7)		
AB	8 (6.4)	0 (0.0)	(0.0-0.0)	8 (8.1)	(3.7-12.5)		
RH ($n = 124$)							
Positivo	99 (79.8)	18 (69.2)	(61.8-76.6)	81 (82.7)	(76.6-88.8)	.169*	
Negativo	25 (20.2)	8 (30.8)	(23.4-38.2)	17 (17.3)	(11.2-23.4)		
Health professionals ($n = 134$)							
Physician	38 (28.3)	14 (50.0)	(42.0-58.0)	24 (22.6)	(15.9-29.3)	.017*	5.8 (0.9-34.7)***
Nurse	61 (45.5)	9 (32.1)	(24.6-39.6)	52 (49.1)	(41.1-57.1)		
Auxiliary nurse	35 (26.2)	5 (17.9)	(11.8-24.0)	30 (28.3)	(20.8-35.2)		
Years of experience ($n = 120$)							
<10 years	39 (32.5)	6 (22.2)	(15.5-28.9)	33 (35.5)	(27.8-43.2)	.422*	
≥10 years	81 (67.5)	21 (77.8)	(71.1-84.5)	60 (64.5)	(56.8-72.2)		
Type of administration ($n = 133$)							
Military	85 (63.9)	20 (74.1)	(67.1-81.1)	65 (61.3)	(53.5-69.1)	.218*	
Civil	48 (36.1)	7 (25.9)	(18.9-32.9)	41 (38.7)	(30.9-46.5)		
Work environment ($n = 123$)							
Intensive care	47 (38.2)	9 (34.6)	(27.0-42.2)	38 (39.2)	(31.4-47.0)	.384*	
Hospitalization	46 (37.4)	8 (30.8)	(23.4-38.2)	38(39.2)	(31.4-47.0)		
Urgency	30 (24.4)	9 (34.6)	(27.7-42.2)	21 (21.6)	(15.0-28.2)		
Flu vaccine ($n = 131$)							
Yes	28 (21.4)	6 (21.4)	(14.4-28.4)	22 (21.3)	(14.3-28.3)	.994*	
No	103 (78.6)	22 (78.6)	(72.0-85.2)	81 (78.7)	(72.0-85.2)		
Suffering from chronic disease ($n = 130$)							
Yes	31 (24.2)	7 (25.9)	(18.9-32.9)	24 (23.3)	(16.5-30.1)	.776*	
No	99 (77.3)	20 (74.1)	(67.1-81.1)	79 (76.7)	(69.9-83.5)		
Physical activity ($n = 130$)							
Yes	105 (80.8)	21 (80.7)	(73.9-87.5)	84 (80.7)	(73.9-87.5)	.981*	
No	25(19.2)	5 (19.2)	(12.4-26.0)	20 (19.2)	(12.4-26.0)		
Vitamin D deficiency ($n = 97$)							
Yes	18 (18.5)	6 (27.2)	(18.3-36.1)	12 (11.2)	(4.9-17.5)	.018*	
No	79 (81.5)	16 (72.8)	(63.9-81.7)	63 (58.9)	(49.1-68.7)		
Vitamin D supplementation ($n = 133$)							
Yes	16 (12.0)	7 (25.0)	(18.1-31.9)	9 (8.6)	(4.1-13.1)	.047*	
No	117 (88.0)	21 (75.0)	(68.1-81.9)	96 (91.4)	(86.9-95.9)		
Smoking ($n = 134$)							
Yes	17 (12.7)	2 (7.4)	(3.2-11.6)	15 (14.0)	(8.4-19.6)	.559*	
No	84 (62.7)	19 (70.4)	(63.3-77.1)	65 (60.7)	(52.9-68.5)		
Ex-smoker	33 (24.6)	6 (22.2)	(15.5-28.9)	27 (25.3)	(18.3-32.1)		
Alcohol ($n = 133$)							
Less than once a week	82 (61.6)	15 (53.6)	(45.6-61.6)	67 (63.8)	(56.1-71.5)	.322*	
Drink at least once a week	51 (38.4)	13 (46.4)	(38.4-54.4)	38 (36.2)	(28.5-43.9)		

(continued)

TABLE I. (Continued)

	Total *n* (%)	Cases *n* (%)	IC 95%	No cases *n* (%)	IC 95%	*P*-value	OR (IC 95%)
Stress scale							
M (DT)	3.47 (1.9)	2.86 (2.1)	(0.0-4.4)	3.92 (1.9)	(0.0-4.1)	.012**	
Stress type ($n = 134$)							
Low	109 (81.3)	25 (89.3)	(84.4-94.2)	84 (79.2)	(72.7-85.7)	.225*	
Medium	25 (18.7)	3 (10.7)	(5.8-15.6)	22 (20.8)	(14.3-27.3)		

Source: Own elaboration.
*Chi-cuadrado.
**T-Student, *P*-value < .05, M—arithmetic mean, DT—standard deviation, NS/NC—don't know/no answer, n—absolute frequency.
Abbreviation: BMI; body mass index.

exhaustion and weariness after the practice of health care. It should be taken into account that of the 150 professionals, 15 did not undergo any diagnostic test and therefore could not be classified as a case or healthy, so there were a total of 135 individuals. The selection through probability sampling stratified by sex and type of health professional should have included 107 women (72 were included) and 66 men (60 were included), 84 nurses (compared to 61 in our study), 53 physicians (compared to 38 in our study), and 34 nursing assistants (35 were included).

The percentage of cases obtained in this hospital was 20.7%. In other studies the seroprevalence ranged from 0.75% (95% CI 0.0-8.13),[6] 164% in the study done in Spain[7] or 18.5% in the study done in Ontario.[8]

Of the total number of health care personnel who responded to the questionnaire, 54.5% were women, similar figures were found in the not cases (59.6%), but the majority of cases were men (64.3 CI 95% 56.1-72.5) and a statistically significant association was found. Other studies have found different results, in two carried out in Spain on health personnel (2020), 23.4% and 23.8% of the cases were men,[4] another in Girona where the percentage of women was 90.1%,[7] as well as another carried out in Wuhan where 50% were women,[5] another in Canada with 81.7% of women,[8] another in Buenos Aires where the percentage of women was 71.83%,[6] and another in Germany where the percentage was 73%.

Probability of Exposure to Different Risk Factors in Cases versus Not Cases

This difference may have been because of the fact that many medical officers from the Military Health Corps were commissioned, in reserve status (personnel who cease to be on active duty when they reach 61 years of age). All the personnel were male and with a high age range, which may have increased the number of cases and explained the increase in male cases (41.7% vs. 28.6%). The mean BMI (24.9 kg/m^2 SD 3.9) of the total and not cases was within the normal weight range, while the mean BMI of the cases was elevated (25.3 kg/m^2 SD 3.8) and was in the overweight range. One study used data from the UK Biobank ($n = 285,817$) to show that being overweight increased the risk of COVID-19 by 44.0% (relative risk [RR] = 1.44; 95% CI, 1.08-1.92; $P = .010$).[10] Two studies showed that the odds of having COVID-19 were increased by 30% (OR = 1.30; 95% CI, 1.09-1.54; $P = .003$)[11] and 38% (OR = 1.38; $P < .001$)[10] respectively, among overweight/obese individuals. The mechanisms responsible for the increased prevalence of COVID-19 in overweight/obese individuals are unknown. Knowledge of other viral infections, such as influenza, provides insight into how excess weight increases the risk of COVID-19 severity. Understanding why this pathology increases the risk of severe COVID-19 is critical to ensure appropriate preventive and interventional therapies against this novel coronavirus. The percentage of cases with positive blood group A was higher than the other groups, although the result was not significant, the difference was substantial. Similar data were found in a study done in China where group A was associated with a higher risk of COVID-19 infection compared to types AB and O.[12] In another study they suggest that while blood group A may play a role in increasing susceptibility to COVID-19 infection, blood group O may be somewhat protective. However, once infected, blood group type does not appear to influence clinical outcome.[13] According to another study done in Changsha First Hospital, China, the proportion of patients with type A blood in the COVID-19 group was significantly higher than that in the control group (36.9% vs. 27.5%, $P = .006$) and concluded that patients with blood group A had a higher risk of SARS-CoV-2 infection, while blood group O was associated with a lower risk, indicating that certain ABO blood groups correlated with susceptibility to SARS-CoV-2.[14] In the distribution by professional group in the cases with respect to the not cases and the total number of study participants, physicians were overrepresented, with statistically significant differences, as was the case in another study conducted in a Wuhan Hospital.[5] Different results were found in other studies where the professional groups that presented higher susceptibility were nurses and assistants who spent more time in contact with patients where the values ranged from 20.2% to 52%).[7,8] This discrepancy and the increase in cases among physicians could be because of the performance of bronchoscopies, intubations, or site examinations where exposure levels were higher compared to the care activities performed by nurses and auxiliaries, except for the suctioning activities of ICU staff.[15] Cases with 10 or more

TABLE II. Epidemiological Background of Exposure

	Total ($n = 150$)	Cases n (%)	IC 95%	No cases n (%)	IC 95%	P-value	OR (IC 95%)
Exposed to COVID-19 patients in their daily work ($n = 134$)							
Yes	107 (79.9)	23 (82.1)	(75.6-88.6)	84 (79.2)	(72.3-86.1)	.499	
Little exposure	22 (16.4)	5 (17.9)	(11.4-24.4)	17 (16.0)	(9.8-22.2)		
No exposure	5 (3.7)	0 (0.0)	(0.0-0.0)	5 (4.7)	(1.1-8.3)		
Average exposure time ($n = 131$)							
<5 hours	37 (28.2)	10 (35.7)	(27.6-43.8)	27 (26.2)	(18.7-33.7)	.323	
≥5 hours	94 (71.8)	18 (64.3)	(56.1-72.5)	76 (73.8)	(66.3-81.3)		
Working hours ($n = 131$)							
Morning shift	77 (58.8)	21 (77.8)	(70.7-84.9)	56 (53.8)	(45.3-62.3)	.024*	1.7 (0.5-5.7)
Rest of shifts	54 (41.2)	6 (22.2)	(15.1-29.3)	48 (46.2)	(37.7-54.7)		
Number of working hours per day ($n = 134$)							
M (DT)	8.7 (1.7)	8.6 (1.0)	(3.9-13.3)	8.8 (1.9)	(4.0-13.6)	.673	
Weekly days off ($n = 134$)							
M (DT)	1.32 (0.7)	1.25 (0.7)	(0.0-2.1)	1.44 (0.7)	(0.0-2.1)	.251	
Adequate training for handling PPE ($n = 129$)							
A lot	8 (6.3)	1 (3.7)	(0.5-6.9)	7 (6.9)	(2.6-11.2)	.077	
Quite a lot	35 (27.1)	9 (32.1)	(24.2-40.0)	26 (25.7)	(18.3-33.1)		
A little	63 (48.8)	9 (32.1)	(24.2-40.0)	54 (53.5)	(45.1-61.9)		
Not at all	23 (17.8)	9 (32.1)	(24.2-40.0)	14 (13.9)	(8.0-19.8)		
In the removal of the PPE, it has always been under supervision ($n = 126$)							
Always	6 (4.9)	0 (0.0)	(0.0-0.0)	6 (6.0)	(2.0-10.0)	.562	
Often	9 (7.1)	2 (7.7)	(3.2-12.2)	7 (7.0)	(2.7-11.3)		
Ocassionally	12 (9.5)	2 (7.7)	(3.2-12.2)	10 (10.0)	(4.9-15.1)		
Hardly ever	41 (32.5)	7 (26.9)	(19.4-34.4)	34 (34.0)	(26.0-42.0)		
Never	58 (46.0)	15 (57.7)	(49.3-66.1)	43 (43.0)	(34.6-51.4)		
You have safely followed withdrawal steps ($n = 124$)							
Always	53 (42.7)	6 (25.0)	(17.7-32.3)	47 (47.0)	(38.5-55.5)	.009*	6.4 (1.6-25.8)*
Often	53 (42.7)	10 (41.7)	(33.4-50.0)	43 (43.0)	(34.6-51.4)		
Hardly ever	18 (14.6)	8 (33.3)	(25.3-41.3)	10 (10.0)	(4.9-15.1)		
When leaving contaminated areas, was the outermost layer removed? ($n = 119$)							
Always	78 (65.5)	11 (47.8)	(39.3-56.3)	67 (69.8)	(62.0-77.6)	.46	
Hardly ever	41 (34.5)	12 (52.2)	(43.7-60.7)	29 (30.2)	(22.4-38.0)		
In relation to the material, there have been ($n = 134$)							
Enough	29 (21.6)	5 (18.5)	(11.9-25.1)	24 (22.4)	(15.3-29.5)	.659	
Little	105 (78.4)	22 (81.5)	(74.9-88.1)	83 (77.6)	(70.5-84.7)		
Suitable material ($n = 132$)							
Yes	88 (66.7)	17 (60.7)	(52.4-69.0)	71 (68.3)	(60.4-76.2)	.452	
No	44 (33.3)	11 (39.3)	(31.0-47.6)	33 (31.7)	(23.8-39.6)		
Have you reused the material? ($n = 133$)							
Yes	117 (88.0)	22 (78.6)	(71.7-85.5)	95 (90.5)	(85.5-95.5)	.204	
No	16 (12.0)	6 (21.4)	(14.5-28.3)	10 (9.5)	(4.5-14.5)		

Source: Own elaboration.
*P-value < .05.
Abbreviation: OR; odds ratio.

years of experience and membership in the military administration were proportional to the total and not cases. The percentage of cases who received the influenza vaccine was very low compared to those who did not, but in the same proportion between cases, not cases and totals, no difference was observed. Numerous studies show that influenza vaccination does not increase the risk of COVID-19 infection.[16] This study provides reassurance against speculation

that influenza vaccine increases the risk of COVID-19 infection. In addition, other studies claim that influenza vaccination may be associated with lower severity and lower mortality from COVID-19.[17,18]

With regard to vitamin D, those with vitamin D deficiency who also took supplements had a lower risk of suffering COVID-19, both in the total and in cases and not cases, with a significant association. In this case, the factor that produces positive effects, reducing contagion and improving prognosis, is vitamin D supplementation and not the deficit itself. Several studies report an association between CRP positivity and vitamin D deficiency. The exact efficacy of vitamin D supplementation for the prevention or as adjunctive treatment of COVID-19 remains to be determined, but several ongoing randomized controlled trials are actively investigating these potential benefits.[19,20] Professionals with a low mean stress level were associated with a higher number of cases, being proportional to the total and to the not cases (low stress level 89.3% cases vs. medium level 10.7% cases). These results did not correspond to those of another study in which it was reported that the presence of psychosocial risks had important consequences for the quality of care and increased the probability of errors.[21]

Likewise, the number of cases among exposed personnel was higher than among non-exposed personnel (82.1% versus 0.0%), and no differences were found, since the number of exposed not cases was also very high compared to those not exposed, which could suggest that exposure is not as important as nosocomial or community transmission. The same results were not found in a study done in Spain, where greater direct exposure led to a higher number of infections.[7] It would be advisable to maintain a safe distance between professionals, hand hygiene, and the use of personal protective equipment. The number of cases among the personnel who worked during the morning shift and who had fewer days off than the not cases was higher than in other shifts or in the case of the not cases, with a statistically significant association. The morning shift is the one with the greatest work overload and the highest number of health professionals. These two factors, nosocomial transmission and overload, are two important factors to be taken into account for prevention.[22] It would be advisable to increase the number of health care personnel during this shift to reduce overload; other studies have obtained similar data.[23] Continuing with the epidemiological risk antecedents, the cases had fewer days off (1.25 SD 0.7) than the not cases (1.44 SD 0.7). In relation to protective equipment, there were hardly any cases among those who showed adequate training in the use of the equipment.

Signs and Symptoms Presented by the Cases and Which Factors Influenced the Appearance of Them

Of the different signs and symptoms, fever, cough, and diarrhea were found in at least 50% of the sample with significant differences, and the proportion of cases that also showed other symptoms such as headache or sore throat was not negligible.[24,25] In a study conducted in Spain,[4] fever and cough were also the most representative signs. Fever was identified more frequently and with significant differences, in men with chronic diseases and without vitamin D deficiency.[4] Sore throat was identified among those who had not been vaccinated against influenza. In a specific analysis, it was observed that health workers with pneumonia were significantly overweight and did not practice any type of sporting activity compared to those who did not have pneumonia. On the other hand, cough was significantly more frequent in health care personnel with more than 10 years of experience.

The most important limitation of this study refers to the sample. This difference could have been because of the short time available to the health personnel or to exhaustion after the practice of health care. Likewise, if a sample size calculation had been made with an error percentage of 5% and a confidence level of 95%, the number of individuals should have been 173 as opposed to the 150 that made up our study.

CONCLUSIONS

The percentage of SARS-CoV-2 cases in the HCDGU HCW was 20.7%.

64.3% of the cases were male ($P < .05$), with a mean age of 47.1 (SD 13.3), the mean BMI of the cases was in the overweight range. In the distribution by professional group in cases with respect to not cases and total study participants, physicians were overrepresented, with statistically significant differences. Cases and not cases with vitamin D deficiency and who took supplements had a lower risk of suffering COVID-19, with significant differences. The number of cases among staff on the morning shift and with fewer days off than not cases was higher than in other shifts, with a statistically significant association.

Fever, cough, and diarrhea were found in at least 50% of the sample with significant differences, in addition to headache or sore throat.

ACKNOWLEDGMENTS

To all the health care personnel who have worked at the Hospital Central de la Defensa and who have collaborated in this research study despite their physical and mental exhaustion.

FUNDING

Not applicable.

CONFLICT OF INTEREST STATEMENT

All authors declare no conflicts of interest.

AUTHORS' CONTRIBUTIONS

M.J.A.B. designed this study and obtained funding. C.F.M., L.E.B.O., and L.H.P. analyzed and collected the data. M.J.A.B., M.P.V., J.W., and N.P.F. wrote the manuscript. N.P.F., C.F.M., M.P.V., and L.H.E. provided critical revisions that are important for the intellectual content. All authors read and approved the final manuscript.

DATA AVAILABILITY

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This trial was approved by the Ethics Committee for Research on Drugs of the "Gómez Ulla" Central Military Defense Hospital (33_20). Informed consent was obtained from all participants.

CONSENT FOR PUBLICATION

Not applicable.

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