UNIVERSIDAD PERUANA UNIÓN

ESCUELA DE POSGRADO

Unidad de Posgrado de Ciencias de la Salud

Factores asociados a conocimientos, actitudes y prácticas preventivas hacia el COVID-19 en profesionales dela salud en Lima, Perú

Tesis para obtener el Grado Académico de Maestra en Salud Pública con mención en Gestión de los Servicios de Salud

Autor:

Oriana Rivera Lozada de Bonilla

Asesor:

Dr. César Augusto Gálvez Vivanco

Lima, julio de 2021

ANEXO 07 DECLARACIÓN JURADA DE AUTORIA DE LA TESIS

Yo **CÉSAR AUGUSTO GÁLVEZ VIVANCO**, identificado con DNI N° **10172109,** asesor de la Escuela de Posgrado de la Universidad Peruana Unión;

DECLARO:

Que la tesis titulada: ***Factores asociados a conocimientos, actitudes y prácticas preventivas hacia el COVID-19 en profesionales de la salud en Lima, Perú,*** constituye la memoria que presenta Oriana Rivera Lozada de Bonilla, para obtener el grado académico de Maestro en Salud Pública con mención en Gestión de los Servicios de Salud, cuya tesis ha sido desarrollada en la Universidad Peruana Unión con mi asesoría.

Asimismo, dejo constancia de que las opiniones y declaraciones registradas en la tesis son de entera responsabilidad de la autora. No comprometen a la Universidad Peruana Unión.

Para los fines pertinentes, firmo esta declaración jurada, en la cuidad de Ñaña (Lima), a los 27 días del mes de julio de 2021.

DR. CÉSAR AUGUSTO GÁLVEZ VIVANCO
Asesor

Nº 369

ACTA DE SUSTENTACIÓN DE TESIS DE MAESTRO(A)

En Lima, Ñaña, Villa Unión, a **27** del mes de **julio** del año **2021** siendo las **15:00 pm**, se reunieron en el Salón de Grados y Títulos de la Universidad Peruana Unión, bajo la dirección del Señor Presidente del Jurado: **Dr. Marcos Enrique Flores González**, el secretario: **Mg. Wilter Charming Morales García** y los demás miembros: **Mg. Edda Evnet Newball Noriega, Mg. Guido Angelo Huapaya Flores** y el asesor: **Dr. César Augusto Gálvez Vivanco**, con el propósito de administrar el acto académico de sustentación de Tesis de Maestro(a) titulada: **"Factores asociados a conocimientos, actitudes y prácticas preventivas hacia el COVID-19 en profesionales de la salud en Lima, Perú",** de la Dra. **ORIANA RIVERA LOZADA DE BONILLA** Conducente a la obtención del Grado Académico de Maestro(a) en:

Maestría en Salud Pública con **mención en Gestión de los Servicios de Salud**. El Presidente inició el acto académico de sustentación invitando al candidato hacer uso del tiempo determinado para su exposición. Concluida la exposición, el Presidente invitó a los demás miembros del Jurado a efectuar las preguntas, cuestionamientos y aclaraciones pertinentes, los cuales fueron absueltos por el candidato. Luego se produjo un receso para las deliberaciones y la emisión del dictamen del Jurado.

Posteriormente, el Jurado procedió a dejar constancia escrita sobre la evaluación en la presente acta, con el dictamen siguiente:

Dra. **ORIANA RIVERA LOZADA DE BONILLA**

CALIFICACIÓN	**ESCALAS**			**Mérito**
	Vigesimal	**Literal**	**Cualitativa**	
APROBADO	20	A	Con nominación de Excelente	Excelencia

(*) Ver parte posterior

Finalmente, el Presidente del Jurado invitó al candidato a ponerse de pie, para recibir la evaluación final. Además, el Presidente del Jurado concluyó el acto académico de sustentación, procediéndose a registrar las firmas respectivas.

_____	_____
Presidente	Secretario

_____	_____	_____
Asesor	Miembro	Miembro

_____

Bachiller/Licenciado(a)

Factors associated with knowledge, attitudes and preventive practices towards COVID-19 in health care professionals in Lima, Peru

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abstract

Background: Nowadays, we are facing a disease caused by SARS-CoV-2, known globally as COVID-19, which is considered a threat to global health due to its high contagiousness and rapid spread. **Methods:** Analytical cross-sectional study in 302 health professionals. An online questionnaire consisting of questions about knowledge, attitudes and practices (KAP) towards COVID-19 was applied. Socio-demographic, occupational and comorbidities factors were explored. Simple and multiple logistic regression models were used to identify factors associated with KAP. **Results:** Of the total, 25.2%, 31.5% and 37.4% had high levels of knowledge, preventive practices and risk perception attitudes respectively. Being married (aOR=6.75), having a master's degree (aOR= 0.41), having a working day with less than ten hours (ORa=0.49) and obesity (aOR=0.38) were associated with a low level of knowledge of COVID-19. The variables associated with preventive practices were being over the age of 50 (aOR=0.52), working in the hospitalization area (aOR=1.86) and having comorbidities such as arterial hypertension (aOR=0.28) and obesity (aOR=0.35). In relation to negative attitudes towards COVID 19, it was found that physical contact with patients with a confirmed diagnosis (aOR=1.84) and having asthma (aOR=2.13) were associated with these attitudes. **Conclusion:** Being married, having a master's degree, working less than ten hours were associated with having a low level of knowledge of COVID-19. Being older than 50, working in the hospitalization area were associated with preventive practices. Physical contact with COVID-19 patients was associated with negative attitudes.

Keywords

Health Knowledge, Attitudes and Practice; Health Personnel; Coronavirus infections; Peru.

Introduction

Nowadays, we are facing a disease caused by SARS-CoV-2, known globally as COVID-19, which is considered a threat to global health due to its high contagiousness and rapid spread[1]. According to the World Health Organization (WHO), 159,896,332 cases of the disease have been reported, which has caused more than 3,321888 deaths worldwide since its emergence until May 12, 2021[2]. Peru is no stranger to this reality as reports indicate an increase in cases. On May 12, 2021, the Ministry of Health (MINSA) reported 1,858.239 cases and 64,691 deaths, which makes us the sixth nation in the world in number of patients[3]. However, there was a discrepancy between what was reported by MINSA and the numbers of the National Death Registry Information System (Sistema Informático Nacional de defunciones, SINADEF) since this institution reported 130,195 cases on the same date.

In the country, health professionals are a population group at high risk of contracting COVID-19, because they are on the frontline in the fight against the disease. This disease is highly infectious; there is no specific treatment and access to vaccination is still limited[4,5]. This is why healthcare professionals must acquire sufficient knowledge to treat patients in an efficient and timely manner and, at the same time, protect themselves from contracting the disease.

It should be emphasized that, during the pandemic, health professionals are overworked, in addition to feeling fear of contracting the disease[6-8]. This makes it more critical for any country to overcome the disease and protect health professionals at the same time[7].

Consequently, a key element to overcome the pandemic is to follow the guidelines established by organizations such as WHO and MINSA. Among the challenges Peru is facing, we have to mention the importance of adequate dissemination of information among health professionals, so that they can be updated with recent advances in managing the disease.

Hence, the low level of knowledge, attitudes and practices (KAP) in regard to the implementation of preventive measures against the disease[9-14] could cause a serious public health scenario for the control of the pandemic, since health personnel are responsible for dealing with it [15-18].

Previous studies have reported that having a low level of knowledge, risk perception attitudes and preventive practices represents a negative impact on the behavior of a disease in health professionals[19-24]. Therefore, it is essential to know what factors are associated with knowledge, attitudes and practices to face COVID-19, providing evidence that is potentially useful for health facilities to improve health interventions, which will reduce occupational exposure to COVID-19 in health professionals.

Methods

Study setting and design

The study used an analytical cross-sectional design. The sample consisted of 302 health professionals who worked in health facilities in Lima-Callao and who also taught at the Faculty of Health Sciences of Norbert Wiener University, distributed in 8 academic professional schools (APS) *(Human medicine, Nursing, Obstetrics, Medical technology, Odontology, Human Nutrition, Psychology and Postgraduate School)* in the term 2020-II. The instrument was administered in the period August-December, 2020.

Study population and size

The sample size was calculated probabilistically in two stages. In the first, the sample size was determined; and in the second, the number of sample elements in each of the strata was calculated through proportional allocation. The sample size was divided by the population size and multiplied by the size of each stratum (APS). Thus, the size of the stratum was directly proportional to the sample size and the sampling was performed randomly since the sampling frame was available, where the medical, nursing and obstetrics schools had a representativeness of 37,1% 14,4 % and 14,3% respectively.

Study procedure and tool

The instruments, described in the following pages, were validated by the judgment of ten experts, including pulmonologists, infectious disease specialists and epidemiologists, who determined their applicability to health professionals in Peru.
The measurement of associated factors - socio-demographic, occupational and comorbidities, including aspects such as age, gender, area of work, working hours, contacts with patients with covid-19, presence of diabetes, hypertension, among others - was carried out with a questionnaire consisting of 20 questions.

The competencies of health professionals on COVID 19 were measured through their *level of knowledge, preventive practices and risk perception attitudes*. For the level of knowledge about COVID-19, the WHO guidelines for clinical management of COVID-19 [25] and the questionnaire of *Bhagavathula* et al [26] were considered. To this end, an instrument of 44 questions was used to explore aspects such as *etiology, symptoms, transmission, diagnosis, and prevention*; the test score was from 0 to 44 points. These questions were answered on a true/false and "don't know" basis. Correct questions had one point and incorrect or unanswered answers would have zero; scores were converted into percentile, a percentile ≥ 75% was categorized as high knowledge and <75% as low level of knowledge. The reliability of the instrument was 0.51, which was obtained through the use of the KR-20 test.

For the formulation of preventive practices, the COVID-19 clinical management guidelines, by WHO[25] and the Kim and Choi questionnaire[27] were used as bases. Eleven questions were considered with aspects such as *hand washing, social distancing, surface disinfection, use of personal protective equipment, response to possible contagion*; the test options were formulated on a Likert scale, which were subsequently recategorized into "yes" or "no" dichotomous scales, where one point was assigned to appropriate preventive practice and zero points to inappropriate preventive practice. Scoring ranged from 0 to 11 points; a percentile ≥ 75% was categorized as high level of preventive practices, and <75% as low level of preventive practices. The instrument had a reliability of 0.78, which was obtained through the KR-20 test.

The attitude questions about risk perception were based on *Zhang*'s questionnaire[28], which considered seven questions that included aspects such as *confidence in defeating the virus, fear of infecting the family, concern that the equipment could not work, physical and mental exhaustion*. The test options were formulated on a Likert scale and were subsequently ranked on dichotomous "yes" or "no" scales. One point was assigned to an affirmative response and zero points to a negative response; scoring ranged from 0 to 7 points. A percentile ≥ 75% was categorized as high level of risk perception and <75% as low level of risk perception. The instrument presented a reliability of 0.77 using the KR-20 test.

Data collection was carried out through the administration of an online questionnaire using *Google Forms* ®. Before filling in the questionnaire, everything was clearly and precisely explained via e-mail: the objectives of the study, voluntary participation, respect for confidentiality, the use of the obtained results and the description of the contact data. The surveys were anonymous and the data were treated with strict confidentiality; therefore, the filling of the instruments signified that informed consent of the professionals had been given to participate in the study.

Data management and analysis

Data analysis was performed in three phases. The first included descriptive analysis of the variables, using frequencies for the categorical variables. The second phase considered bivariate analysis, where the association between variables was evaluated by means of contingency tables, using the Odds ratio (OR) with its corresponding confidence interval - 95%CI, for the statistical significance of the contingency tables the X^2 test or Fisher test was used as appropriate. Finally, in the third phase, a binary logistic regression analysis was performed to determine the factors associated with low levels of knowledge, *risk perception attitudes and preventive practices regarding COVID-19 infection* in health professionals. The analyses were performed in the IBM SPSS statistics program version 26 licensed by University of Valle (Cali, Colombia).

Ethical considerations

Ethical standards were respected throughout the research process; the Institutional Research Ethics Committee of the Norbert Wiener University approved the study protocol and informed consent procedures with file No. -181-2020.

Results

Information was obtained from 302 health professionals who were providing health care services during the period August-December 2020. Regarding epidemiological variables, 64.9% corresponded to the female gender, the median age was 46 years (IQR 42 - 51), with greater participation of those under 50 years of age (73.5%). Regarding marital status, 87.4% (n=264) were married or cohabiting, 7.0% (n=21) divorced and 5.6% (n=17) single, 91.4% (n=276) had children. In regard to professions, 52.9% were physicians,35.1% were nurses and 11.92% were obstetricians. The level of education corresponded to Master's degree (79.1%), Doctorate (11.9%) and specialty (8.9%).

According to the area of work, the participants worked with outpatient consultation (32.8%), hospitalization (28.1%), intensive care unit (15.9%), emergency (13.9%) and clinical laboratory (9.3). The median number of years of service was 5 (IQR 3 - 8) and the median daily working time was 8 hours (IQR 7 - 8).

Regarding the level of knowledge, it was established that 25.2% presented scores ≥ the 75th percentile, this parameter allowed us to establish the high level of knowledge about COVID 19. The lowest level of responses were those related to the severity of the disease according to age groups (42.7%), time of subsistence of the virus (50%) and the need for specialized hospitals upon suspicion or diagnosis of infection (55.6%).

In the case of preventive practices, 31.5% (n=95) obtained scores above the 75th percentile, indicating a high level. A low level was identified in practices such as the use of disposable gloves in the workplace (45%), disposable gown (42.1%), use of personal protective equipment (PPE) (25.2%) and decontamination of surfaces (7.7%).

The level of risk perception attitudes was analyzed with an inverse scale, determining the frequency of low level of manifestation of negative attitudes. A total of 37.4% (n=113) obtained scores above the 75th percentile, with a predominance of fear of becoming infected (49.7%), returning home and infecting the family (45%) and fear of dying from COVID 19 (49.7%).

Due to the bivariate analysis, it was possible to establish that there was an association between having a low level of knowledge and epidemiological variables such as being married (OR=7.01; CI: 1.64-29.85), having a master's degree (OR=0.496; CI 0.27 - 0.90); work factors such as working more than 8 hours (OR=0.36 CI: 0.16-0.75) and having family members diagnosed with COVID 19 (OR=0.47; CI 0.24 - 0.92).

In regard to preventive practices, an association was recognized with epidemiological variables such as age, being older than 50 years (OR=0.45; CI 0.24-0.83), use of public transport (OR=1.68; CI 1.03-2.77). Likewise, with respect to occupational factors, an association was found with belonging to the hospitalization area (OR=2.11 CI 1.25 - 3.56).

With regard to having a low level of negative attitudes, it was found that there was an association of these attitudes with having family members with suspicion (OR=1.50; CI 1.08 -2.64), having had contact with patients diagnosed with COVID (OR=1.92; CI 1.20 - 3.09), having had contact with patients with suspicion (OR=1.8; CI 1.05 - 3.08). In relation to health status, it was established that having asthma was associated with having a low level of negative risk perception attitudes (OR=2.29; CI 1.17 - 4.50) **(Table 1 and 2).**

Table 1. Association between epidemiological variables and level of knowledge, practices and negative attitudes

Epidemiological Variables	Knowledge				Practice				Negative attitudes			
	Low level (%, n)	**High level (%, n)**	**OR (95% CI)**	***P***	**Low level (%, n)**	**High level (%, n)**	**OR (95% CI)**	***P***	**Low level (%, n)**	**High level (%, n)**	**OR (95% CI)**	***P***
Gender												
Male	33.6 (76)	39.5 (30)	1	0,356	32.4 (67)	41.1 (39)	1	0,142	37.6 (71)	31.0% (35)	1	0,245
Female	66.4 (150)	60.5 (46)	0,77 (0,45-1,13)		67.6 (140)	58.9 (56)	0,68 (0,41-1,13)		62.4 (118)	69 (78)	1,34 (0,81-2,20)	
Age												
35 – 49 years old	74.3 (168)	71.1 (54)	1	0.575	69.1 (143)	83.2 (79)	**1**	**0.01**	70.9 (134)	77.9 (88)	1	0.18
50 – 65 years old	25.7 (58)	28.9 (22)	1.18 (0.66 – 2.1)		30.9 (64)	16.8 (16)	**0,45** (0,24-0,83)		29.1 (55)	22.1 (25)	0.69 (0.40-1.19)	
Marital status*												
Single/ cohabiting	15.9 (36)	2.6 (2)	1		11.1 (23)	15.8 (15)			13.2 (25)	11.5 (13)		
Married / cohabiting	84.1 (190)	97.4 (74)	7.01 (1.64-29.85)	**0.001**	88.9 (184)	84.2 (80)	0.66 (0.33 – 1.34)	0.255	86.8 (164)	88.5 (100)	1.17 (0.57-2.39)	0.66
Children	10.2	3.9	1	0.104	7.7	10.5	0.71	0.42	6.8	15.2	0.79	0.59
No	(23)	(3)			(16)	(10)	(0.31-1.6)		(15)	(11)	(0.35-1.80)	
Yes	89.8 (203)	96.1 (73)	2.75 (0.80-9.45)		91.6 (191)	91.0 (85)			93.2 (189)	84.8 (113)		
Level of education												
Specialty	7.1 (16)	14.5 (11)	1		11.6 (24)	3.2 (3)	1		10.6 (16)	3.0 (11)	1	
Master	82.3 (186)	69.7 (53)	**0.496** (0.27-0.90)	**0.020**	78.3 (162)	81.1 (77)	1.18 (0.64–2.18)	0.57	77.1 (150)	86.4 (89)	0.96 (0.54-1.70)	0.90
Doctorate	10.6 (24)	15.8 (12)	1.57 (0.74-3.33)	0.229	10.1 (21)	15.8 (15)	1.61 (0.81-3.38)	0.16	12.3 (22)	10.6 (13)	0.94 (0.45-1.93)	0.86
Religion												
Non Catholic	19.0 (43)	22.4 (17)	1	0.528	19.3 (40)	21.1 (20)	1	0.727	22.8 (43)	15.0 (17)	1	
Catholic	81.0 (183)	77.6 (59)	0.815 (0.43-1.53)		80.7 (167)	78.9 (75)	0.89 (0.49-1.64)		77.2 (146)	85.0 (96)	1.66 (0.89-3.08)	0.10
Transport												
Private	63.3 (143)	59.2 (45)	1	0.527	**66.2 (137)**	**53.7 (51)**	**1**	**0.037**	62.3 (119)	62.1 (69)	1	0.74

Public	36.7 (83)	40.8 (31)	1.18 (0.69-2.01)		33.8 (70)	46.3 (44)	**1.68 (1.03-2.77)**		37.7 (70)	37.9 (44)	1.08 (0.67-1.75)	

Table 2. Association between work variables and comorbidities, and the level of knowledge, practices and negative attitudes.

	Knowledge				Practice				Negative attitudes			
Occupational factors	**Low level (%, n)**	**High level (%, n)**	**OR (95% CI)**	**P**	**Low level (%, n)**	**High level (%, n)**	**OR (95% CI)**	**P**	**Low level (%, n)**	**High level (%, n)**	**OR (95% CI)**	**P**
Work area												
Outpatient consultation	29.6 (67)	42.1 (32)	1		37.7 (78)	22.1 (21)	1		28.0 (53)	40.7 (46)	1	
Emergency	15.9 (36)	7.9 (6)	0.45 (0.18-1.12)	0.08	13.0 (27)	15.8 (15)	1.25 (0.63-2.47)	0.52	16.4 (31)	9.7 (11)	0.55 (0.26-1.14)	0.105
Hospitalization	27.4 (62)	30.3 (23)	1.14 (0.64-2.03)	0.635	23.2 (48)	38.9 (37)	**2.11 (1.25-3.56)**	**0.005**	29.6 (56)	25.7 (29)	0.82 (0.48-1.38)	0.45
Laboratory	9.3 (21)	9.2 (7)	0.99 (0.40-2.43)	0.98	10.1 (21)	7.4 (7)	0.70 (0.29-1.7)	0.44	10.1 (19)	8.0 (9)	0.40 (0.33-1.77)	0.54
UCI	17.7 (40)	10.5 (8)	0.55 (0.24-1.23)	0.139	15.9 (33)	15.8 (15)	0.98 (0.51-1.92)	0.97	15.9 (30)	15.9 (18)	1.004 (0.53-1.89)	0.99
Working years												
2 - 5 years	48.7 (110)	55.3 (42)	1		50.2 (104)	50.5 (48)	1		50.3 (95)	50.4 (57)	1	
6 – 10 years	32.3 (73)	23.7 (18)	0.65 (0.36-1.18)	0.157	28.5 (59)	33.7 (32)	1.27 (0.76-2.14)	0.36	30.7 (58)	29.2 (33)	0.93 (0.56-1.55)	0.78
More than 11 years	19.0 (43)	21.1 (16)	1.13 (0.59-2.16)	0.7	21.3 (44)	15.8 (15)	0.69 (0.36-1.32)	0.26	19.0 (36)	20.4 (23)	1.08 (0.60-1.94)	0.78
Working hours												
Up to 4 hours	2.2 (5)	7.9 (6)	1		1.6 (3)	7.2 (8)	1		1.6 (3)	7.1 (8)	1	
Up to 8 hours	70.4 (159)	80.3 (61)	1.71 (0.91-3.22)	0.09	74.9 (155)	68.4 (65)	0.72 (0.42-1.08)	0.24	72.5 (137)	73.5 (83)	1.05 (0.62-1.77)	0.85
More than 9 hours	27.4 (62)	11.8 (9)	**0.36** (0.16-0.75)	**0.006**	23.7 (49)	23.2 (22)	0.97 (0.54-1.72)	0.92	25.9 (49)	19.5 (22)	0.69 (0.39-1.21)	0.2
Relatives diagnosed with the disease												
No	69.9 (158)	82.9 (63)	1	0,027	72.5 (150)	74.7 (71)	1	0,67	77.2 (147)	66.4 (75)	1	0.039
Yes	84 (68)	16 (13)	0.47 (0.24-0.92)		27.5 (57)	25.3 (24)	0.89 (0.51-1.54)		22.8 (43)	33.6(38)	1.72 (1.03-2.88)	
Relatives with suspected COVID-19												
No	78.3 (177)	82.9 (63)	1	0.393	76.3 (158)	86.3 (82)	1	**0.046**	82.0 (155)	75.2 (85)	**1**	**0.015**
Yes	21.7 (49)	20.9 (13)	0.74 (0.38-1.46)		26.2 (49)	10.8 (13)	0.511 (0.26-0.99)		18.0 (34)	24.8 (28)	**1.50 (1.02-2.64)**	
Contact with Covid patients												
No	32.3 (73)	28.9 (22)	1	0.586	33.8 (70)	26.3 (25)	1	0.192	34.4 (65)	26.5 (30)	1	0,156
Yes	67.7 (153)	71.1 (54)	1.17 (0.66-2.06)		66.2 (137)	73.7 (70)	1.43 (0.83-2.45)		65.6 (124)	73.5 (83)	1.45 (8.67-2.42)	
COVID patient admission												
No	65.0 (147)	59.2 (45)	1	0.361	66.7 (138)	56.8 (54)	1	0.099	66.1 (125)	59.3 (67)	1	0.23
Yes	35.0 (79)	40.8 (31)	1.28 (0.75-2.18)		33.3 (69)	43.2 (41)	1.52 (0.92-2.49)		33.9 (64)	40.7 (46)	1.34 (0.83-2.17)	
Visual contact												

No	38.9 (88)	35.5 (27)	1	0.596	40.1 (83)	33.7 (32)	1	0.309	41.3 (78)	32.7 (37)	1	0.14
Yes	61.1 (138)	64.5 (49)	1.157 (0.67-1.98)		59.9 (124)	66.3 (63)	1.32 (0.79-2.19)		58.7 (111)	67.3 (76)	1.44 (0.88-2.35)	
Physical contact												
No	54.4 (123)	47.4 (36)	1	0.287	55.6 (115)	46.3 (44)	1	0.135	58.7 (111)	42.5 (48)	**1**	**0.006**
Yes	45.6 (103)	52.6 (40)	1.32 (0.78-2.23)		44.4 (92)	53.7 (51)	1.44 (0.89-2.35)		41.3 (78)	57.7 (113)	**1.92 (1.20-3.09)**	
Contact with surface												
No	54.0 (122)	61.8 (47)	1	0.232	59.4 (123)	48.4 (46)	1	0.074	60.3 (114)	48.7 (55)	1	0.166
Yes	46.0 (104)	38.2 (29)	0.724 (0.42-1.23)		40.6 (84)	51.6 (49)	1.56 (0.96-2.54)		39.7 (75)	51.3 (58)	1.60 (1.002-2.6)	
Contact with suspected Covid-19												
No	31.0 (70)	25.0 (19)	1	0.323	29.0 (60)	30.5 (29)	1	**0.78**	33.9 (64)	22.1 (25)	1	0.03
Yes	69.0 (156)	75 (57)	1.34 (0.74-2.43)		71.0 (147)	69.5 (66)	**0.93** (0.54-1.57)		66.1 (125)	77.9 (88)	1.8 (1.05-3.08)	
Comorbidity												
None	58.0 (131)	69.7 (53)			54.6 (113)	74.7 (71)	1		64.0 (121)	55.8 (63)	1	
Asthma	15.0 (34)	7.9 (6)	0.48 (0,19-1.20)	0.112	14.0 (29)	11.6 (11)	0.80 (0.38-1.68)	0.563	9.5 (18)	19.5 (22)	2.29 (1.17-4.50)	**0.014**
Diabetes	3.1 (7)	-	-	-	1.9 (4)	3.2 (3)	1.65 (0.36-7.54)	0.682	2.1 (4)	2.7 (3)	1.26 (0.27-5.74)	0.524
Hypertension	6.6 (15)	13.2 (10)	2.13 (0.91-4.96)	0.074	10.6 (22)	3.2 (3)	0.27 (0.080-0.94)	0.041	6.3 (12)	11.5 (13)	1.91 (0.84-4.36)	0.116
Obesity	17.3 (39)	9.2 (7)	0.48 (0.21-1.13)	0.09	18.8 (39)	7.4 (7)	0.34 (0.14-0.79)	0.010	18.0 (34)	10.6 (12)	0.54 (0.26-1.09)	0.085

Predictors of the level of knowledge, preventive practices and negative risk perception attitudes towards COVID 19

Logistic regression analysis identified epidemiological variables, work characteristics and the presence of comorbidities significantly associated with having a low level of knowledge of COVID 19. Among the predictor variables, statistically significant differences were identified in married or cohabiting professionals (adjusted OR = 6. 75, 95%CI 1.46 - 31.2), having a master's degree (adjusted OR = 0.41, 95%CI 0.21 - 0.80), having a working day of less than 10 hours (adjusted OR = 0.49, 95%CI 0.25 - 0.95) and having obesity as a comorbidity (adjusted OR = 0.38, 95%CI 0.15 - 0.95). The multivariate analysis allowed us to estimate a coefficient of determination of 0.16, which explains 16% of the variance in the level of knowledge.

In relation to preventive practices, statistically significant differences were identified among the predictor variables in professionals over 50 years of age (adjusted OR = 0.52, 95%CI 0.27 - 0.98), working in the hospitalization area (adjusted OR = 1.86, 95%CI 1.08 - 3.18) and having comorbidities such as arterial hypertension (adjusted OR = 0.28, 95%CI 0.081 - 0.99) and obesity (adjusted OR = 0.35, 95%CI 0.14 - 0.83). The multivariate analysis allowed us to estimate a coefficient of determination of 0.19, which explains 19% of the variance of the dependent variable.

Finally, in relation to negative attitudes towards COVID 19, the most parsimonious multivariate model included physical contact with patients with confirmed diagnosis (adjusted OR = 1.84, 95%CI 1.14 - 2.97) and having asthma as a comorbidity (adjusted OR = 2.13, 95%CI 1.081 - 4.22). The multivariate analysis allowed us to estimate a coefficient of determination of 0.23, which explains 23% of the variance of the dependent variable **(Table 3).**

Table 3. Predictors of the level of knowledge, preventive practices and negative attitudes towards COVID 19

Part A. Regression model for knowledge				
Variable	**Statistical test**	**Degrees of freedom**	**OR (95%CI)**	**p**
Marital status				0,014
Married - Cohabiting	10.095	1	6.75 (1.46 – 31.2)	
Level of education			0,41 (0.21 – 0.80)	0,009
Master	6.312	1		
Working hours a day	6.525		0,49 (0.25 – 0,95)	0,036
Less than10 hours		1		
Comorbidity			0.38 (0,15 – 0.95)	0.039
Obesity	1,689	1		
Constant	0.553	1	0.336	≤ 0,001
Part B. Regression model for practice				
Variable	**Statistical test**	**Degrees of freedom**	**OR (95% CI)**	**p**
Age				
Older than 50	3.127	1	0.52 (0.27 – 0.98)	0,0077
Work area				
Hospitalization	5.57	1	1.86 (1.08 – 3.18)	0,018
Comorbidity				
Arterial hypertensión	5.43	1	0.28(0.081 – 0,99)	0,02
Comorbidity				
Obesity	5.497	1	0.35 (0.14 – 0.83)	0,019
Constant	-1.456	1	0,459	≤ 0,001
Part C. Model for attitudes				
Variable	**Statistical test**	**Degrees of freedom**	**OR (95%CI)**	**p**
Contact with patients with				
confirmed diagnosis	6.228	1	1.84 (1.14– 2.97)	0,006
Comorbidity				
Asthma	5.807	1	2.13 (1,081 – 4.22)	0,029
Constant	0,536	1	0.598	≤ 0,001

Discussion/Conclusion

Our study revealed that health professionals have insufficient knowledge about COVID-19 (more than 70% did not have a high level), in contrast to a study in Nigeria[29], where less than 20% of health professionals reported insufficient knowledge. Although frontline health staff are expected to have a high level of knowledge of SARS-CoV-2, our study found a high knowledge gap regarding severity of the disease according to age group and time of virus persistence. Knowledge about the severity of the disease according to age group represents a weak link for clinical management, since therapeutic management is prioritized according to the risk of acquiring a disease or its complications[30]. Regarding the time of SARS-CoV-2 virus persistence, it is important to highlight its survival, which is at least 72 hours on plastic surfaces and stainless steel[31]. This is fundamental for the prevention of person-to-person or patient-to-healthcare worker transmission during clinical care.

The present study revealed that being married represents a higher probability of having a low level of knowledge. However, this association was not observed in regard to the level of practices and attitudes. This could happen due to a social problem, as married people might have less time to do COVID-19 training courses, unlike single people who might have more free time to acquire such knowledge. However, the level of practices and attitudes would not change, which could be due to the experience acquired in health care.

It was found that having a master's degree, working more than eight hours and having relatives diagnosed with COVID-19 were associated as a protective factor, that is, they are less likely to have a low level of knowledge. This could be because self-learning, such as having a master's degree, plays a key role in the process of acquiring COVID-19 knowledge. Similar studies in physicians found that younger physicians and those who did not work much time with patients had lower COVID-19 knowledge scores[32]. Having comorbidities was associated with good knowledge, attitudes and practices towards COVID-19, this may happen due to the fact that being a population at risk demanded greater care and attention to this disease compared to other groups that are not at risk[33]. This would mean that there are unmet needs and knowledge is not being equitable.

Two thirds of the sample were found to have a low level of preventive practices. The low level of preventive practices was associated with elements of personal protective equipment-PPE. A study in Turkey found that health professionals had a high level of knowledge about COVID-19, however preventive behaviors were low, similar to what was seen in this study, gender, work area and being specialists were related to prevention[33]; similar results were found in Indonesian physicians[34]. These are the available tools to prevent health personnel from becoming infected and then infecting their contacts[35]. The education that health personnel receive should not only be about knowing about the appropriate elements that should be used, but also their correct use, since it is fundamental to prevent health personnel from becoming infected. Although health care professionals have general knowledge in this regard, in the context of this pandemic they should be continuously trained and receive updated information related to the available evidence to date. The inadequate use of protective measures and elements can favor the breakdown of the skin and mucosal barrier in workers due to frequent cleaning and prolonged use of PPE, gloves and disposable

gowns, causing dermatitis, secondary infections or aggravation of existing skin diseases[36].

It is known that healthcare professionals who have received instructions on donning and doffing PPE could decrease the risk of making errors as well as those who have had active training with spoken instructions and computer simulation in correct PPE removal[37]. A study in Jordan found that there was an association between biosafety at work and good biosafety practice at home, with the biosafety score at work being 73% (considered low by the researchers)[35]. The only way to control new potentially deadly epidemics such as the one we are experiencing, and from an early stage is to educate the population and especially health personnel with optimal behavior of biosafety practices and maximum PPE protection. [38, 39]

In relation to preventive practices, an association with epidemiological variables such as age, being older than 50 years was identified. This suggests that an increase in knowledge may lead to a better attitude and practice. In this case, it is known that COVID-19 affects people of any age, but people over 60 years of age more severely[40], which may imply that older health professionals, knowing that they are a population at higher risk of disease, may follow better recommendations regarding preventive practices against COVID-19. Similarly, with respect to occupational factors, an association with belonging to the hospitalization area was identified; a possible explanation may be that due to the serious clinical conditions of patients with COVID-19 in hospitalization, the involved physicians and health personnel made greater efforts to have good preventive practices against contagion.

In the present study, we found that certain groups of medical professionals have little knowledge about COVID-19, which is why the importance of ensuring the delivery of knowledgeable information to medical professionals should be emphasized. These low levels of knowledge would explain why Peru has one of the highest rates of medical professionals infected with COVID-19. This should be taken into account by front line care teams, managing physicians and, in general, all health professionals in order to eliminate knowledge gaps and improve COVID-19 knowledge scores, attitudes and practices.

Knowledge is a prerequisite for establishing prevention beliefs, forming positive attitudes and promoting positive behaviors; people's cognition and attitudes towards the disease affect the effectiveness of their coping strategies and behaviors to some extent[41]. The risk perception of healthcare workers could strongly affect not only their mental health but also their exposure to this risk [42, 43], this may be related to the low knowledge score found, so healthcare workers would be more susceptible to have COVID-19 infection. Our study found that the level of risk perception attitudes that predominated was the manifestation of fear of becoming infected (49.7%), this coincides with what was reported by Zhou *et al.*, Abdel *et al.* and Maleki *et al.* [44-46] who found that between 85% and 92% of healthcare workers, are afraid of becoming infected with the disease and transmitting it to the family. Determining the perceived risk by healthcare workers is considered the basic tool to change the attitude and make the workplace healthier and safer.[42,43]

In our results, the second most frequently mentioned element that makes health workers afraid of becoming infected is the fear of returning home and infecting the family (45%). This is higher than the findings of Abdelhafiz et al[47] where approximately 23% of respondents from the general population reported stigma associated with the disease. Abdelhafiz et al. explained this stigma as fear of fatality and high transmissibility, which would also explain the association with low level of negative attitudes such as relatives with suspected COVID-19 and having had contact with patients diagnosed with COVID-19. Although stigma may not seem relevant, it is important, as it can lead to public reluctance to seek medical care and underreporting of cases, which can cause the rapid spread of the disease. Stigma can be combated through proper education, a clear announcement of health policies, and launching stigma reduction programs in hospitals[47].

The main limitation of this study is that the attitudes and practices of health professionals may be overestimated, as they may answer interview questions in a way that they believe to be socially acceptable rather than completely accurate, this is, because of "social desirability"[48, 49]. However, we believe that this could not have affected the measurement of knowledge. Another limitation was the low percentage of surveyed health professionals working in hospitalization and in the Intensive Care Unit; also, we could not survey another group of health professionals who were working in more complex health institutions, therefore, we cannot infer the level of knowledge, attitudes and practices in them.

In conclusion, being married, having a master's degree, working less than 10 hours were associated with a low level of knowledge of COVID-19 in health professionals. Being older than 50 years, working in the hospitalization area was associated with preventive practices. Physical contact with patients with COVID-19 was associated with the report of negative attitudes towards COVID-19. We recommend that universities and health institutions incorporate comprehensive training programs that seek to improve knowledge and promote preventive measures against COVID-19.

Data availability

Underlying data

Zenodo [Factors associated with knowledge, attitudes and preventive practices towards COVID-19 in health care professionals in Lima, Peru]. DOI: **10.5281/zenodo.4780623.** https://doi.org/10.5281/zenodo.4780623

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