



RESEARCH ARTICLE

REVISED Factors associated with knowledge, attitudes and preventive practices towards COVID-19 in health care professionals in Lima, Peru [version 3; peer review: 2 approved]

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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 CI(1.46-31.2) p=0.014, having a master's degree aOR=0.4, CI(0.21-0.80) p=0.009, having a working day with less than ten hours ORa=0.49 CI(0.25-0.95) p=0.036 and obesity aOR=0.38 CI (0.15-0.95) p=0.039 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 CI(0.27-0.98) p=0.007, working in the hospitalization area aOR=1.86 CI(1.08-3.18) p=0.018 and having comorbidities such as arterial hypertension aOR=0.28 CI(0.081-0.99) p=0.02 and obesity aOR=0.35 CI(0.14-0.83) p=0.019. In relation to negative attitudes towards COVID-19, it was found that physical contact with patients with a confirmed diagnosis aOR=1.84 CI (1.14-2.97) p=0.006 and having asthma aOR=2.13

Open Peer Review

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CI(1.081-4.22) $p=0.029$ were associated with these attitudes.

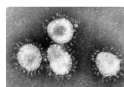
Conclusion: Our study revealed that health professionals have an insufficient level of knowledge of COVID-19. This is why we recommend implementing strategies such as health literacy programs among health care workers. Thus, they can help develop positive

Keywords

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



This article is included in the **Emerging Diseases and Outbreaks** gateway.



This article is included in the **Coronavirus** collection.

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REVISED Amendments from Version 2

The minor changes suggested by the reviewer were made which was to change the abbreviation of IC in the abstract of the document before: IC Now: CI.

Any further responses from the reviewers can be found at the end of the article

Introduction

Since its emergence, the disease produced by SARS-CoV-2, a coronavirus globally known as COVID-19, has been considered a threat to public health due to its contagiousness and rapid spread.¹ According to the World Health Organization (WHO), by the end of 2020—our study period—84,582,043 cases and 1,908,199 deaths were reported in the world.² Peru, as well as other countries in Latin America, has been greatly affected due to the increase in confirmed cases. As of December 31, 2020, there have been 1,022,426 cases and 93,551 deaths since the report of the first case of COVID-19 in the national territory. Thus, Peru was one of the twenty countries with the highest burden of the disease and it became the fifth nation with the highest rate of deaths in the world.³

In this context, some studies on the COVID-19 pandemic undertaken in the country have offered some interesting learned lessons, although it is possible to find more questions than answers, which makes it difficult to find strategies that contribute towards the optimization of the health system's response to this disease.⁴ Thus, health professionals are extremely important actors in the addressing of this disease. They are responsible for the care of the population and lead prevention and control measures. However, this question always arises: How well prepared are they to carry out these activities? what is their level of knowledge, preventive practices and attitudes towards risk perception of COVID-19?⁵

It should be added that health professionals are a population at high risk of contracting COVID-19, because they are on the front line of the fight against the disease. On the other hand, COVID 19 generates much fear, as this disease does not have a specific treatment and the population's access to vaccination is still limited.^{6,7} Consequently, health professionals have to acquire sufficient knowledge to treat patients efficiently and in a timely manner and, at the same time, protect themselves from contracting the disease. If we add fear of contracting COVID 19 to work overload,⁸⁻¹⁰ it becomes even more critical for any country to overcome this situation and provide care to health professionals at the same time.⁹

Hence, low levels of knowledge, attitudes and practices (KAP) regarding the implementation of preventive measures against the disease^{2-6,9} can cause serious public health issues, as health personnel must assume responsibility for the care and control of the pandemic.⁷⁻¹⁰ Given the challenges Peru has faced, adequate dissemination of information among health professionals is important for them to be updated with recent advances in the management of the disease.

Previous studies have reported that having low levels of knowledge, risk perception attitudes and preventive practices leads to a negative impact on behavior towards the disease in healthcare professionals.¹¹⁻¹⁶ Therefore, it is essential to know what factors are associated with KAP to address COVID-19 to provide potentially useful evidence for healthcare facilities to improve healthcare interventions, which will reduce occupational exposure to COVID-19 in healthcare professionals.

Methods**Study setting and design**

The study used an analytical cross-sectional design. The sample population consisted of 302 health professionals who worked in healthcare facilities in Lima-Callao, and who also taught at the Faculty of Health Sciences of Norbert Wiener University, distributed across eight academic professional schools (APS) (Human medicine, Nursing, Obstetrics, Medical technology, Odontology, Human Nutrition, Psychology and Postgraduate School) in the second half of 2020. The instrument was administered during the following period: August 01-December 15, 2020.

Study population and size

The sample size was calculated probabilistically in two stages. In the first stage, we determined the sample. For this study, the sample frame was 672 teachers, who were registered in the database of the human resources area of the university. For the calculation of the sample, an expected 50% prevalence was considered, using a confidence level of 97% and an error percentage of 3% and we could obtain an estimated sample of 277 participants. In the second stage, the number of sample elements in each of the strata was calculated through proportional allocation. This was done by dividing the

sample size by the population size and then multiplying by the size of each of the strata (APS). Thus, the size of the stratum was directly proportional to the sample size.

Sampling was performed through random selection of participants, since the list of health professionals from the academic professional schools (APS) that were part of the study population was available.

Human Medicine, Nursing and Obstetrics were the schools with the highest representation, with 37.1%, 14.4% and 14.3%, respectively.

To achieve the objectives of our study, we used the following selection criteria: health professionals working at a health facility in Lima-Callao who, in addition, were teaching at the Faculty of Health Sciences or at the Graduate School of Norbert Wiener University. The exclusion criteria considered work at the university for less than one year.

Study procedure and tool

The questionnaire, described in the following pages, was validated by the judgment of ten experts, including pulmonologists, infectious disease specialists and epidemiologists, who determined their applicability to healthcare professionals in Perú.

The questionnaire which measured associated factors before the pandemic had 20 questions that included sociodemographic factors (age, gender, marital status, number of children, level of education, religion and transportation), occupational factors (work area, working hours, contact with COVID-19 patients, relatives with suspected COVID-19 and physical contact with COVID-19 patients), comorbidity factors (diabetes, hypertension, asthma, cardiovascular diseases, obesity and overweight).

The competencies of health professionals on caring for COVID-19 patients were measured through their level of knowledge, preventive practices and risk perception attitudes. Regarding the level of knowledge on COVID-19, the WHO guidelines for clinical management of COVID-19¹⁷ and the questionnaire developed by Bhagavathula *et al.*¹⁸ were considered. To this end, a survey of 44 questions was used to explore professionals' knowledge on the disease's etiology, symptoms, transmission, diagnosis, and prevention; the test score ranged from 0 to 44 points. These questions were answered on a true/false and "don't know" basis. Correct questions scored one point and incorrect or unanswered answers scored zero; scores were converted into percentiles, a percentile $\geq 75\%$ was categorized as high knowledge (33 or more correct answers) and $<75\%$ as low level of knowledge (fewer than 33 correct answers). The reliability of the questionnaire was 0.51, which was obtained through the use of the KR-20 to measure internal consistency, and is considered an accepted value to develop research processes.¹⁹

Regarding the formulation of preventive practices-related questions, these were based on COVID-19 clinical management guidelines by WHO¹⁷ and the Kim and Choi questionnaire.²⁰ Eleven questions considered practices such as hand washing, social distancing, surface disinfection, use of personal protective equipment, response to possible contagion. The answers were formulated on a Likert scale, which were subsequently recategorized into a "yes" or "no" dichotomous scale, where one point was assigned to an appropriate preventive practice and zero points to an inappropriate preventive practice. Scoring ranged from 0 to 11 points; a percentile $\geq 75\%$ was categorized as high level of preventive practices (eight or more correct answers) and $<75\%$ as low level of preventive practices (fewer than eight correct answers). The instrument obtained a reliability coefficient of 0.78 through the KR-20 internal consistency index, and is therefore considered an acceptable level to develop research processes.¹⁹

The attitude-related questions associated to risk perception were based on Zhang's questionnaire,²¹ which considered seven questions addressing factors such as confidence in defeating the virus, fear of infecting the family, concern that the equipment could not work, physical and mental exhaustion. The answers were formulated on a Likert scale and were subsequently ranked on a dichotomous "yes" or "no" scale. One point was assigned to an affirmative response and zero points to a negative response; scoring ranged from 0 to 7 points. A percentile $\geq 75\%$ was categorized as high level of risk perception (five or more correct answers) and $<75\%$ as low level of risk perception (fewer than five correct answers). The questionnaire obtained a reliability coefficient of 0.77 using the KR-20 internal consistency index, and is considered an acceptable level to develop research processes.¹⁹

Data collection was carried out through the distribution of an online questionnaire using Google Forms. Before filling out 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 completion of the questionnaires implied the informed consent of the professionals to participate in the study.

Data management and analysis

Data analysis was performed in three phases. The first phase included descriptive analysis of the variables, using frequencies of the categorical variables. The second phase considered bivariate analysis, where the association between variables was evaluated by means of contingency tables, using odds ratios (OR) with their corresponding 95% CI confidence interval; for the statistical significance of the contingency tables, we used Fisher's exact test when more than 20% of cells had expected frequencies < 5. 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 toward COVID-19 infection in health professionals. The analyses were performed using SPSS version 26 (IBM) statistics program with a license provided 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 about 302 health professionals who were providing healthcare services during the period August-December 2020 was obtained. Regarding epidemiological variables, 64.9% were female and the median age was 46 years old (IQR 42-51), with greater participation of those under 50 old (73.5%). Regarding marital status, 87.4% (n = 264) were married or cohabiting, 7.0% (n = 21) were divorced and 5.6% (n = 17) were single, 91.4% (n = 276) had children. Regarding 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%) (Table 1).

Regarding the area of work, the participants worked in outpatient consultation (32.8%), internal medicine department at the hospital (28.1%), intensive care unit (15.9%), emergency (13.9%) and clinical laboratory departments (9.3%). The median number of years of service was five (IQR 3-8) and the median daily working time was eight hours (IQR 7-8).

Table 1. Demographic characteristics of the population.

Demographic Variables	% (n)	CI 95%
Gender		
Male	35.1 (106)	29.8 - 40,7
Female	64.9 (196)	59.3 - 70,2
Age		
35 - 49 years old	73,5 (222)	68,5 - 78,8
50 - 65 years old	26,5 (80)	21,2 - 31,5
Marital status*		
Single/cohabiting	12,6 (38)	9.3 - 16,2
Married/cohabiting	87,4 (264)	83.8 - 90.7 (74)
Children		
No	8.6 (26)	5.6 - 11.9
Yes	91.4 (276)	88.1 - 94.4
Level of education		
Specialty	8.9 (27)	6.0 - 12.6
Master	79.1 (239)	74.5 - 83.8
Doctorate	11.9 (36)	8.3 - 15.6
Religion		
Non-Catholic	19.9 (60)	15.2 - 24.5
Catholic	80.1 (242)	75.5 - 84.8
Transport		
Private	62.3 (188)	56.6 - 67.5
Public	37.7 (114)	32.5 - 43.4

Table 2. Association between epidemiological variables and level of knowledge, practices and negative attitudes.

Epidemiological Variables	Knowledge			Practices			Negative attitudes			P		
	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)
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	0.001	11.1 (23)	15.8 (15)	0.66 (0.33-1.34)		13.2 (25)	11.5 (13)	1.17 (0.57-2.39)	
Married/cohabiting	84.1 (190)	97.4 (74)	7.01 (1.64-29.85)		88.9 (184)	84.2 (80)			86.8 (164)	88.5 (100)		
Children												
No	10.2 (23)	3.9 (3)	1	0.104	7.7 (16)	10.5 (10)	0.71 (0.31-1.6)		6.8 (15)	15.2 (11)	0.79 (0.35-1.80)	0.59
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

Table 2. Continued

Epidemiological Variables	Knowledge				Practices				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
Religion												
Non-Catholic	19.0 (43)	22.4 (17)	1 0.815 (0.43-1.53)	0.528	19.3 (40)	21.1 (20)	1 0.89 (0.49-1.64)	0.727	22.8 (43)	15.0 (17)	1 1.66 (0.89-3.08)	0.10
Catholic	81.0 (183)	77.6 (59)			80.7 (167)	78.9 (75)			77.2 (146)	85.0 (96)		
Transport												
Private	63.3 (143)	59.2 (45)	1 1.18 (0.69-2.01)	0.527	66.2 (137)	53.7 (51)	1 1.68 (1.03-2.77)	0.037	62.3 (119)	62.1 (69)	1 1.08 (0.67-1.75)	0.74
Public	36.7 (83)	40.8 (31)			33.8 (70)	46.3 (44)			37.7 (70)	37.9 (44)		

*Fisher exact test.
The numbers in bold represent measures of association (Odds Ratio and statistical significance $p < 0.05$).

Table 3. Association between work variables and comorbidity conditions with level of knowledge, practices and negative attitudes.

Occupational factors	Knowledge				Practices				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
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 in the internal medicine department	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 department	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
ICU	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 four hours	2.2 (5)	7.9 (6)	1		1.6 (3)	7.2 (8)	1		1.6 (3)	7.1 (8)	1	
Up to eight 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 nine 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 COVID-19												
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)	

Table 3. Continued

Occupational factors	Knowledge				Practices				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
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-19 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-19 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)	

Table 3. *Continued*

Occupational factors	Knowledge				Practices				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
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

The numbers in bold represent measures of association (Odds Ratio and statistical significance $p < 0.05$).

In the case of level of knowledge, 25.2% showed scores \geq the 75th percentile, where the cut-off point was in the scores greater than or equal to 34, parameter that permitted us to establish a high level of knowledge of COVID-19. The responses with the lowest scores 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 to care for suspected or diagnosed infection (55.6%).

In the case of preventive practices, 31.5% (n = 95) obtained scores above the 75th percentile (the cut-off point was the scores greater than or equal to 11), which indicated a high level. A low level of practices was identified, among them we had the use of disposable gloves in the workplace (45.0%), the use of disposable gowns (42.1%), the use of personal protective equipment (PPE) (25.2%) and the decontamination of surfaces (7.7%).

The level of risk perception attitudes towards COVID 19 was analyzed with an inverse scale and we could determine the frequency of low levels of manifestation of negative attitudes (fear of contagion, fear that family members could contract the disease, fear that personal protective equipment could not work, fear of death) such as confidence, fear, concern, and physical and mental fatigue. A total of 37.4% (n = 113) had scores above the 75th percentile (cut-off point greater than or equal to 5), 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%).

Through a bivariate analysis, it was possible to establish that being married was a risk factor for having low levels of knowledge (OR = 7.01; CI: 1.64-29.85). The study showed, in addition, some preventive factors: having a Master's degree (OR = 0.496; CI 0.27-0.90); working more than nine hours a day (OR = 0.36 CI: 0.16-0.75) and having relatives with diagnosed COVID-19 (OR = 0.47; CI 0.24-0.92).

Regarding preventive practices, it was shown that the use of public transport (OR = 1.68; CI 1.03-2.77), working in the hospital's internal medicine department (OR = 2.11 CI 1.25-3.56) are risk factors for having a low level of preventive practices. However, we found some preventive factors such as being older than 50 (OR = 0.45; CI 0.24-0.83), experiencing comorbid conditions like hypertension (OR = 0.27; CI 0.08-0.94) and obesity (OR = 0.34; CI 0.14-0.79).

Regarding risk perception attitudes, the findings revealed risk factors such as having relatives with suspected COVID-19 (OR = 1.50; CI 1.08-2.64), having had contact with patients diagnosed with COVID-19 (OR = 1.92; CI 1.05-3.08) and having asthma as a comorbid condition (OR = 2.29; CI 1.17-4.50) (Tables 2 and 3).

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

Logistic regression analysis identified that being married (adjusted OR = 6.75, 95%CI 1.46-31.2) was a risk factor for a low level of knowledge of COVID 19. Preventive factors, such as having completed a Master's degree (adjusted OR = 0.41, 95%CI 0.21-0.80), working more than 9 hours a day (adjusted OR = 0.49, 95%CI 0.25-0.95), presenting with obesity as a comorbidity condition (adjusted OR = 0.38, 95%CI 0.15-0.95) were also found. Multivariate analysis allowed us to estimate a coefficient of determination of 0.16, which explained 16% of the variance of the level of knowledge.

In relation to preventive practices, it was found that working in the hospital's internal medicine department (adjusted OR = 1.86, 95%CI 1.08-3.18) was a predictor variable of risk for low level of preventive practices. In addition, protective factors such as being older than 50 (adjusted OR = 0.52, 95%CI 0.27-0.98), presenting with comorbidities such as hypertension (adjusted OR = 0.28, 95% CI 0.08-0.99) and obesity (adjusted OR = 0.35, 95%CI 0.14-0.83) were found. Multivariate analysis allowed us to estimate a coefficient of determination of 0.19, which explained 19% of the variance in the level of preventive practices.

Finally, regarding risk perception attitudes towards COVID-19, physical contact with patients with a confirmed diagnosis (adjusted OR = 1.84, 95%CI 1.14-2.97) and presenting with asthma as a comorbidity condition (adjusted OR = 2.13, 95% CI 1.081-4.22) were found as predictor variables. Multivariate analysis allowed us to estimate a coefficient of determination of 0.23, which explained 23% of the variance in the level of risk perception attitudes (Table 4).

Discussion

Our study revealed that healthcare professionals in Perú have insufficient knowledge about COVID-19 (more than 70% did not have a high level of knowledge), in contrast to a study in Nigeria,²² where fewer than 20% of health professionals showed insufficient knowledge. Although frontline healthcare staff are expected to have a high level of knowledge of SARS-CoV-2, our study found a large knowledge gap regarding the severity of the disease according to age group and duration of virus persistence. Knowledge of the severity of the disease according to age group represents a weak link in

Table 4. Predictors of level of knowledge, preventive practices and negative attitudes towards COVID 19.

Part A. Regression model for knowledge			
Variable	Wald Statistic	OR (95%CI)	p
Marital status Married/cohabiting	10.095	6.75 (1.46 – 31.2)	0.014
Level of education Master	6.312	0.41 (0.21 – 0.80)	0.009
Working hours, a day More than nine hours	6.525	0.49 (0.25 – 0.95)	0.036
Comorbidity Obesity	1.689	0.38 (0.15 – 0.95)	0.039
Constant	0.553	0.336	≤ 0.001
Part B. Regression model for practices			
Variable	Wald Statistic	OR (95% CI)	p
Age Older than 50	3.127	0.52 (0.27 – 0.98)	0.0077
Work area Hospitalization	5.57	1.86 (1.08 – 3.18)	0.018
Comorbidity Arterial hypertension	5.43	0.28(0.081 – 0.99)	0.02
Comorbidity Obesity	5.497	0.35 (0.14 – 0.83)	0.019
Constant	-1.456	0.459	≤ 0.001
Part C. Model for attitudes			
Variable	Wald Statistic	OR (95%CI)	p
Contact with patients with confirmed COVID-19	6.228	1.84 (1.14– 2.97)	0.006
Comorbidity Asthma	5.807	2.13 (1.081 – 4.22)	0.029
Constant	0.536	0.598	≤ 0.001

clinical management, since therapeutic management is prioritized according to the risk of contracting a disease or its complications.²³ Regarding the persistence of the SARS-CoV-2 virus, it is important to highlight it can survive at least 72 hours on plastic surfaces and stainless steel.²⁴ This is fundamental in 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. Authors such as Naser *et al.*,²⁵ and Rani *et al.*,²⁶ have shown associations between marital status and low levels of knowledge of COVID-19 in health professionals in Saudi Arabia, where low levels of knowledge were found in single health professionals, as opposed to married health professionals, which can be explained by cultural aspects of Eastern countries such as believing that children and young adults are at a lower risk of contracting the disease, attending crowded places such as markets and mosques, in addition to their low acceptance of the use of masks.^{25,26} These results are different from what we found in our study, where a low level of knowledge in married health professional was shown, which can be explained by the fact that the proportion of single population was low (12.6%).

In addition, regarding the methodological aspects of the present study, one factor that may affect the results is the low participation of single people under 40 to the study, which corresponds to the age at which continuous or post-graduate training processes are carried out.

However, this association was not observed in the level of practices and attitudes. This could be due to social reasons, 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 healthcare.

It was found that some factors such as having a Master's degree, working more than nine hours and having relatives diagnosed with COVID-19 were preventive factors against having a low level of knowledge. This could be happening because self-learning, such as that employed when studying for a Master's program, plays a key role in the process of acquiring COVID-19 knowledge. Similar studies in physicians found that younger physicians and those who had not worked with patients for a long time had lower COVID-19 knowledge scores.²⁷ Presenting with comorbidity conditions was associated with good levels of knowledge, attitudes and practices towards COVID-19, which may be due to the fact that being part of a population at risk demands a greater level of care and attention to this disease compared to other groups that are not at risk.²⁸ The presence of comorbidity conditions contributes to the inclusion of self-care behaviors by health professionals, based on their personal and professional experience and, thus, they can minimize the risk of contagion in their workplace.

Studies conducted in some Asian countries found that health professionals had a high level of knowledge of COVID 19, but had low levels of preventive practices, which allows them to affirm that knowledge is not a determining factor in developing preventive practices and attitudes, and that other measures should be implemented, such as improvement of the work environment and access to adequate PPE.^{28,30-32} In our research, it became evident that 75% had low levels of knowledge and preventive practices, despite the fact that about six months had passed since the notification of the first case of COVID 19 in Perú. The explanation for this situation could be related to the fact that much of the information on the pandemic circulating in the academic media came from the opinion of "experts", social networks or the media, which lacked scientific rigor.

It is known that healthcare professionals who have received instructions on donning and discarding PPE could cause a decrease in the risk of making errors, as along with professionals who have had active training with spoken instructions and computer simulation on correct PPE removal.³³ A study in Jordan found that there was an association between biosafety at work and good biosafety practice at home, with a biosafety score at work of 73% (considered low by the researchers).³¹ 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 healthcare personnel to adopt optimal behavior of biosafety practices and maximum PPE protection.^{34,35}

In relation to preventive practices, we could identify an association with epidemiological variables such as age, i.e. being older than 50. This suggests that an increase in knowledge may lead to better attitudes and practices. In this case, it is known that COVID-19 affects people of any age, but people over 60 are more severely affected,³⁶ which may imply that older healthcare professionals, knowing that they are a population at a higher risk of contracting this disease, may follow better recommendations regarding preventive practices against COVID-19. Similarly, with respect to occupational factors, an association with being part of the hospital personnel was identified; a possible explanation may be that due to the serious clinical conditions of patients with COVID-19 in hospitals, the involved physicians and health personnel made greater efforts to have 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 Perú has one of the highest rates of medical professionals infected with COVID-19. This should be taken into account by front line care teams, physician managers and, in general, all health professionals in order to eliminate knowledge gaps and improve COVID-19 knowledge scores, attitudes and practices.

Knowledge allows the establishment of prevention strategies to avoid the spread of the virus, and also facilitates the development of positive attitudes towards the acquisition of self-care habits at work as well as respect for the rights of patients diagnosed with COVID-19, and the recognition of the effectiveness of the treatment plan and coping behaviors.³⁷ In addition, exposure to the virus in the workplace implies a mental burden and could have a negative impact on control measures,^{38,39} which increases the risk of infection. In the present study, among the risk perception attitudes, fear of becoming infected predominated, which coincides with the findings of Zhang *et al.*, Abdel *et al.*, and Maleki *et al.*,^{39,41} who found that between 85% and 92% of healthcare workers expressed fear of transmitting the disease to their family members. Therefore, it can be concluded that the perception of risk is a determining factor for the modification of attitudes in the work environment and the restructuring of healthy and safe behaviors during the working day,^{38,39} which impacts on family and social relations.

These results contrast with the findings of Abdelhafiz *et al.*,⁴³ who stated that stigma associated with the disease is based on fear associated with mortality and its transmission capacity. This could explain the association between the level of negative attitudes in those with relatives with suspected COVID-19, and having had contact with patients diagnosed with COVID-19. Although it may seem irrelevant, stigma is important because it can lead to public reluctance to seek medical care and the underreporting of cases, which can influence the increase in confirmed cases in a scenario characterized by community transmission. Thus, to combat stigma, it is necessary to develop appropriate education strategies framed in health policies and launching de-stigmatization programs in hospitals.⁴³

The main limitation of this study was that the attitudes and practices of health professionals may be overestimated, as they may answer interview questions in a way that they believe is socially acceptable rather than completely accurate, because of “social desirability”.^{44,45} However, we believe that this could not have affected the measurement of knowledge. Another limitation was the low percentage of surveyed health professionals working at the hospital and in the Intensive Care Unit; in addition, we could not survey another group of health professionals who were working in more complex health institutions. Therefore, we cannot infer their level of KAP.

It is assumed that experience with other infectious conditions could support the consolidation of knowledge of COVID in health professionals. However, since it is a condition with different clinical manifestations, it can be concluded that the level of knowledge should be in a continuous process of construction and, thus, it can favor prevention and management strategies. So far, the consolidation of knowledge about COVID 19 has been based on the experience gained when addressing other infectious diseases. However, since it is a new clinical condition, it can be assumed that this level of knowledge is still in a continuous process of construction, hence the importance of this investigation, which contributes evidence to the strengthening of prevention and management strategies. Attitudes and practices in the field of health are based on ideas, beliefs and stereotypes, which guide the behavior of individuals and communities. This has repercussions in the work environment and can persist in scenarios involving everyday life. This has been similarly observed during the COVID 19 pandemic.

Rejection practices involve a high affective and cognitive component; these elements can be addressed through continuing education and health literacy. In Peru, efforts have been made to incorporate changes in information dissemination processes, adjustment in curricula for future professionals and strategies aimed at the general population with the support of mass media, although these efforts are still insufficient. Therefore, it is necessary to continue generating evidence on this problem.

In conclusion, being married, having a Master’s degree, and working more than nine hours a day were associated with a low level of knowledge of COVID-19 in health professionals. Being older than 50, and working at the hospital, were 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 collection instruments

Socio-demographic

1. Cell phone: _____ email: _____
2. Gender: Male () Female ()
3. Age: _____ (years old)
4. Marital status: Single () Married () Cohabiting () Divorced ()
5. Do you have children? Yes () How many?: _____ No ()
6. Level of education: Licentiate () Specialty () Master () Doctorate ()
7. What is your religion? Catholic () Evangelical () Agnostic () Atheist () Other: _____
8. Mean of transportation to get to work:
Public () Private, taxi () Own ()

Occupational

- 9. Work area/section/department/service/unit
- 10. How long have you been working in the area/section/department/service/unit?
- 11. How many hours a day? _____
- 12. Do you have relatives diagnosed with Covid-19? Yes () No ()
- 13. Do you have relatives suspected of Covid-19? Yes () No ()
- 14. Have you had contact with patients diagnosed with Covid-19? Yes () No ()
In case, the answer is positive:
- 15. Did you enter the patient's room? Yes () No ()
- 16. Did you have visual contact? Yes () No ()
- 17. Did you have physical contact with the patient? Yes () No ()
- 18. Did you have contact with any surface contaminated by the patient? Yes () No ()
- 19. Have you had contact with patients suspected of Covid-19? Yes () No ()

Comorbidities

- 20. Comorbidities: Diabetes () Hypertension () Asthma () cardiovascular disease () Chronic respiratory disease () Cancer () respiratory infection during the last 6 months () Obesity ()

Level of knowledge of COVID-19

Questions	True	False	I don't know
21. Is it a respiratory infection caused by a species of the Coronavirus family?			
22. Will all the people under 60 develop mild and moderate cases?			
23. Are only those who are elderly, chronically ill or obese more likely to develop severe cases?			
24. Are fever, cough and shortness of breath the most frequent symptoms?			
25. Is its incubation period up to 14 days with a mean of 5 days?			
26. Can it be diagnosed with an RT-PCR test in samples collected from nasopharyngeal or oropharyngeal secretion or from sputum or bronchial lavage?			
27. Is it transmitted through respiratory droplets eliminated through coughing, sneezing and talking?			
28. ¿Se transmite a través del contacto cercano con un caso infectado especialmente en familias? Is it transmitted through close contact with an infected case, especially within the family?			
29. Can it be transmitted through close contact with an infected case in crowded places?			
30. Can it be transmitted through contact with surfaces contaminated with the virus?			
31. Can this disease be prevented by hand washing and personal hygiene?			
32. In general population, is it necessary to use a surgical mask to prevent transmission?			

Continued

Questions	True	False	I don't know
33. In general population, is an N95 respirator necessary to prevent transmission?			
34. In a health facility, is a surgical mask useful to prevent transmission?			
35. In health facilities, is an N95 respirator useful to prevent transmission?			
36. To prevent contagion, should we maintain distance greater or equal to 2 meters?			
37. Should all the people in a society use a surgical mask?			
38. Only in invasive procedures during hospitalization, is the use of an N95 respirator recommended?			
39. Is there a defined treatment for this disease?			
40. If the symptoms appear within the 14 days after direct contact with a suspected case, does the person have to consult a health facility?			
41. Are COVID-19 and SARS-Cov-2 the same?			
42. Are the people over 60 with comorbidities the main vulnerable groups?			
43. Does the time of subsistence of coronaviruses on the surfaces depend on the surface type, the temperature or the environment humidity?			
44. Does the time of subsistence of coronaviruses on surfaces depend on the use of leech or soap?			
45. Is the time of subsistence of aerosolized coronaviruses in the environment of 3 days?			
46. Does COVID 19 generate immunity and protection for future infections?			
47. Is coronavirus an RNA virus?			
48. Is it true that people infected with COVID-19 cannot infect other people if they do not have a fever?			
49. Should people who have been in contact with a person infected with COVID 19 remain under observation for 14 days?			
50. Are there patients with Covid 19 that never develop symptoms?			
51. Can disposable masks be sterilized and reused?			
52. Can patients suspected of COVID-19 and confirmed cases be located in the same area of the hospital?			
53. Should patients with suspected or confirmed COVID-19 be hospitalized if they have a mild disease?			
54. Are specialized or referral hospitals required for patients with suspected or confirmed Covid 19 infection?			
55. Can 70% ethyl alcohol be used to disinfect delicate reusable equipment such as thermometers?			
56. Does survival of Covid-19 depend on several factors, such as relative temperature, humidity and type of surface?			
57. Should people who have contact with someone infected with COVID-19 virus be immediately isolated in an appropriate place?			
58. In general, the observation period in Covid 19 infection is 14 days?			
59. Is isolation of people infected with COVID-19 virus an effective way to reduce the spread of the virus?			
60. Is treatment with Ivermectin of people infected with COVID-19 virus an effective way to reduce the spread of the virus?			
61. Is the preventive administration of Ivermectin to people in contact with suspected or confirmed COVID-19 cases an effective way to reduce the spread of the virus?			
62. Can early symptomatic and supportive treatment currently help most patients recover from infection?			

Continued

Questions	True	False	I don't know
63. Do children and young adults need to take some measures to prevent COVID-19 virus infection?			
64. Should people who have contact with someone infected with COVID-19 virus immediately isolate themselves in an appropriate place for 14 days?			

Preventive practices

How often do you ... ?	Always	Most of the time	Sometimes	Rarely
65. Do you wear disposable gloves in the workplace?				
66. Do you wear a surgical mask in the workplace?				
67. Do you use a face shield or goggles in the workplace?				
68. Do you use a disposable gown in the workplace?				
69. Do you use personal protective equipment – PPE in the workplace?				
70. During patient care, did you remove and replace your personal protective equipment- PPE according to protocol?				
71. During patient care, did you perform hand hygiene before and after touching the patient although you wore gloves?				
72. Did you perform hand hygiene before and after performing a clean or aseptic procedure (for example, inserting a peripheral vascular catheter, urinary catheter, intubation, etc.)?				
73. Did you perform hand hygiene after being exposed to body fluids of patients that were not suspected or diagnosed Covid 19 cases?				
74. During aerosol-generating procedures on patients who were unsuspected or confirmed Covid 19 cases, did you perform hand hygiene before and after, regardless of whether you wore gloves?				
75. During aerosol generation procedures on patients who were unsuspected or confirmed Covid 19 cases, were high contact surfaces frequently decontaminated?				

Risk perception attitudes

Questions	Always	Most of the time	sometimes	rarely
76. Are you confident that we could win the fight against coronavirus?				
77. Are you afraid or concerned that you might get infected?				
78. Are you afraid/worried about returning home and infecting your family?				
79. Are you afraid/worried that you might die from COVID-19?				
80. Are you afraid/worried that the protective equipment will not work?				
81. Do you experience physical exhaustion due to all the activities you have?				
82. Do you experience mental exhaustion due to all the activities you have?				

Data availability

Underlying data

Zenodo: Factors associated with knowledge, attitudes and preventive practices towards COVID-19 in health care professionals in Lima, Peru <https://doi.org/10.5281/zenodo.4780623>.⁴⁶

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 **Rubia Consuelo Cobo Rendón** 

Laboratorio de Investigación e Innovación educativa, IDECLAB, Dirección de Docencia, Universidad de Concepción, Concepción, Chile

The authors have made the modifications suggested in the previous version, which has substantially improved the quality of the manuscript. I believe it meets the criteria for approval.

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Psychology, well-being and health

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Reviewer Report 25 October 2021

<https://doi.org/10.5256/f1000research.78038.r97526>

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 **Jaime A. Yanez** 

Facultad de Educación, Carrera de Educación y Gestión del Aprendizaje, Universidad Peruana de Ciencias Aplicadas, Lima, Peru

ABSTRACT:

1. A minor change, please change IC for CI. I understand that IC means intervalo de confianza in Spanish, but CI (confidence interval) should be used.
The manuscript should be approved.

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: COVID-19, epidemiology, pharmacology, toxicology, drug development, mental health

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Author Response 31 Oct 2021

ORIANA RIVERA LOZADA, UNIVERSIDAD PERUANA UNION, Lima, Peru

Dear Reviewers,

The observation survey has already been carried out in the abstract (the IC was changed to the IC) and it was sent to the journal for incorporation.

Thank you very much for your comments.

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 CI(1.46-31.2) p=0.014, having a master's degree aOR=0.4, CI(0.21-0.80) p=0.009, having a working day with less than ten hours ORa=0.49 CI(0.25-0.95) p=0.036 and obesity aOR=0.38 CI (0.15-0.95) p=0.039 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 CI(0.27-0.98) p=0.007, working in the hospitalization area aOR=1.86 CI(1.08-3.18) p=0.018 and having comorbidities such as arterial hypertension aOR=0.28 CI(0.081-0.99) p=0.02 and obesity aOR=0.35 CI(0.14-0.83) p=0.019. In relation to negative attitudes towards COVID-19, it was found that physical contact with patients with a confirmed diagnosis aOR=1.84 CI (1.14-2.97) p=0.006 and having asthma aOR=2.13 CI(1.081-4.22) p=0.029 were associated with these attitudes. **Conclusion:** Our study revealed that health professionals have an insufficient level of knowledge of COVID-19. This is why we recommend implementing strategies such as health literacy programs among health care workers. Thus, they can help develop positive

Competing Interests: No competing interests were disclosed.

Version 1

Reviewer Report 11 August 2021

<https://doi.org/10.5256/f1000research.57103.r89964>

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**Jaime A. Yanez**

Facultad de Educación, Carrera de Educación y Gestión del Aprendizaje, Universidad Peruana de Ciencias Aplicadas, Lima, Peru

ABSTRACT

1. It is customary to report not only the aOR but also the CI, as well as the p-value, please include.

INTRODUCTION

1. It feels short. There is a need to mention what has been studied and published so far about COVID-19 in Peru and there are plenty of papers related to COVID-19 in Peru. For instance, there is no mention of the effects the lack of KAP has already caused in Peru. Examples of some studies include:
 - Infodemic^{1,2,3}
 - Self-medication^{4,5}
 - Medicinal plants use^{6,7,8,9}
 - Use of unproven treatments such as chlorine dioxide^{6,10}
 - Issues in children with the development of MIS-C^{11,12,13,14}
 - Impact in mental health^{15,16,17,18,19}
 - Technostress²⁰
 - Issues in adequate implementation of public health measures^{21,22,23}
 - Furthermore, Peru is leading some interesting aspects compared to Latin America in the implementation of telemedicine^{24,25,26,27}

METHODS

1. Please indicate in the Study setting and design the exact dates that the survey was available for responses.
2. What exclusion criteria were used?

3. Please deepen the study population and size. It is not clear if 302 respondents were a sufficient sample size for this study. Also, indicate what power were the authors looking for.
4. It is really hard to follow how big was the instrument. Please include the full survey as an Annex to understand the instrument and for other researchers to replicate it.

RESULTS

1. Change the word "epidemiological" for "demographic" in the following sentence: Regarding epidemiological variables...
2. Please include the demographic data in a table, which is customary for cross-sectional studies.
3. Clarify the value that represented the 75th percentile in this sentence: In the case of preventive practices, 31.5% (n = 95) obtained scores above the 75th percentile. Please include cut-off values for the surveys used.
4. The same comment as above for the level of risk perception.
5. Please include the p-value for the results of the bivariate analysis.
6. Table 3, the constants are not necessary to be reported, nor the degrees of freedom for a dichotomous variable.

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Is the work clearly and accurately presented and does it cite the current literature?

Partly

Is the study design appropriate and is the work technically sound?

Partly

Are sufficient details of methods and analysis provided to allow replication by others?

Partly

If applicable, is the statistical analysis and its interpretation appropriate?

Partly

Are all the source data underlying the results available to ensure full reproducibility?

Partly

Are the conclusions drawn adequately supported by the results?

Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: COVID-19, epidemiology, pharmacology, toxicology, drug development, mental health

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 28 Sep 2021

ORIANA RIVERA LOZADA, UNIVERSIDAD PERUANA UNION, LIMA, Peru

ABSTRACT

It is customary to report not only the aOR but also the CI, as well as the p-value, please include.

Author response: They were added in the abstract.

INTRODUCTION

It feels short. There is a need to mention what has been studied and published so far about COVID-19 in Peru and there are plenty of papers related to COVID-19 in Peru. For instance, there is no mention of the effects the lack of KAP has already caused in Peru. Examples of some studies include:

- Infodemic^{1,2,3}
- Self-medication^{4,5}
- Medicinal plants use^{6,7,8,9}
- Use of unproven treatments such as chlorine dioxide^{6,10}
- Issues in children with the development of MIS-C^{11,12,13,14}
- Impact in mental health^{15,16,17,18,19}
- Technostress²⁰
- Issues in adequate implementation of public health measures^{21,22,23}
- Furthermore, Peru is leading some interesting aspects compared to Latin America in the implementation of telemedicine^{24,25,26,27}

Author response: The introduction was modified, taking into account the references suggested by the reviewer.

METHODS

Please indicate in the Study setting and design the exact dates that the survey was available for responses.

Author response: The period was specified in the Study setting and design section (01 August-15 December 2020).

What exclusion criteria were used?

Author response: We explained this in the Study population and size section: "To achieve the objectives of our study, we used the following selection criteria: health professionals working at a health center in Lima-Callao who, in addition, were teaching at the Faculty of Health Sciences or at the Graduate School of Norbert Wiener University. The exclusion criteria considered work at the university for less than one year."

Please deepen the study population and size. It is not clear if 302 respondents were a sufficient sample size for this study. Also, indicate what power were the authors looking for.

Author response: It was specified in the Study population and size section "The sample size was calculated probabilistically in two stages. In the first stage, we determined the sample. For this study, the sample frame was 672 teachers, who were registered in

the database of the human resources area of the university. For the calculation of the sample, an expected 50% prevalence was considered, using a confidence level of 97% and an error percentage of 3% and we could obtain an estimated sample of 277 participants. In the second stage, the number of sample elements in each of the strata was calculated through proportional allocation. This was done by dividing the sample size by the population size and then multiplying by the size of each of the strata (APS). Thus, the size of the stratum was directly proportional to the sample size.

Sampling was performed through random selection of participants, since the list of health professionals from the academic professional schools (APS) that were part of the study population was available.”

It is really hard to follow how big was the instrument. Please include the full survey as an Annex to understand the instrument and for other researchers to replicate it.

Author response: It was added in annexes.

RESULTS

Change the word "epidemiological" for "demographic" in the following sentence: Regarding epidemiological variables

Author response: It was corrected:

“Information about 302 health professionals who were providing healthcare services during the period August-December 2020 was obtained. Regarding demographic variables, 64.9% were female and the median age was 46 years old (IQR 42-51)”.

Please include the demographic data in a table, which is customary for cross-sectional studies.

Author response: We added Table 1 with the demographic data of the population.

Clarify the value that represented the 75th percentile in this sentence: In the case of preventive practices, 31.5% (n = 95) obtained scores above the 75th percentile. Please include cut-off values for the surveys used.

The same comment as above for the level of risk perception.

Author response: The values were included.

In the case of level of knowledge, 25.2% showed scores \geq the 75th percentile, where the cut-off point was in the scores greater than or equal to 34, a parameter that permitted us to establish a high level of knowledge of COVID-19. The responses with the lowest scores 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 to care for suspected or diagnosed infection (55.6%).

In the case of preventive practices, 31.5% (n = 95) obtained scores above the 75th

percentile (*the cut-off point was the scores greater than or equal to 11*), which indicated a high level. A low level of practices was identified, among them, we had the use of disposable gloves in the workplace (45.0%), the use of disposable gowns (42.1%), the use of personal protective equipment (PPE) (25.2%), and the decontamination of surfaces (7.7%).

The level of risk perception attitudes towards COVID 19 was analyzed with an inverse scale and we could determine the frequency of low levels of manifestation of negative attitudes (fear of contagion, fear that family members could contract the disease, fear that personal protective equipment could not work, fear of death) such as confidence, fear, concern, and physical and mental fatigue. A total of 37.4% (n = 113) had scores above the 75th percentile (cut-off point greater than or equal to 5), 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%).

Please include the p-value for the results of the bivariate analysis

Author response: nIt was included.

Table 3, the constants are not necessary to be reported, nor the degrees of freedom for a dichotomous variable.

Author response: We took the constants and the degrees of freedom out of the table.

Competing Interests: No competing interests were disclosed.

Reviewer Report 03 August 2021

<https://doi.org/10.5256/f1000research.57103.r89965>

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Rubia Consuelo Cobo Rendón 

Laboratorio de Investigación e Innovación educativa, IDECLAB, Dirección de Docencia, Universidad de Concepción, Concepción, Chile

This is a significant study as this manuscript contributes to the identification of factors associated with knowledge, attitudes and preventive practices towards COVID-19 in health care professionals in Lima, Peru. The findings in the study are of value for further research and institutional action associated with the results found in Peru and Latin America.

Following the review, I describe the following suggestions:

Abstract:

- It is suggested to improve the presentation of the conclusions, they look like a repetition of the results.
- The implications of the findings found could be deepened.

Introduction:

- Presentation relevant to the reality of the context studied. It is suggested to deepen the ideas on the justification of the research, with the information presented in the paragraph: "Hence, low levels of knowledge, attitudes and practices (KAP) in regard to the implementation of preventive measures against the disease^{2-6,9} might cause serious public health problems, since health personnel must assume responsibility for care and control of the pandemic.⁷⁻¹⁰".
- Include the objective of the study in the last paragraph.

Method:

- It is important to describe the health context (pandemic) in which the study participants presented themselves at the time of answering the questionnaire.

Study procedure and tool:

- Include the category "Pandemic-associated factors before" the phrase: "relatives with suspected COVID-19 and physical contact with COVID-19 patients)", e.g. "relatives with suspected COVID-19 and physical contact with COVID-19 patients".

The Results and Discussion are well described. Punctuation and spelling throughout the manuscript should be checked.

Reviewer suggestion is appreciated. Best wishes for future work.

Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

I cannot comment. A qualified statistician is required.

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Psychology, well-being and health

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 28 Sep 2021

ORIANA RIVERA LOZADA, UNIVERSIDAD PERUANA UNION, LIMA, Peru

This is a significant study as this manuscript contributes to the identification of factors associated with knowledge, attitudes and preventive practices towards COVID-19 in health care professionals in Lima, Peru. The findings in the study are of value for further research and institutional action associated with the results found in Peru and Latin America.

Following the review, I describe the following suggestions:

Abstract:

- It is suggested to improve the presentation of the conclusions, they look like a repetition of the results.
- **Author response: The conclusion in the abstract was improved: Our study revealed that health professionals have an insufficient level of knowledge of COVID-19. This is why we recommend implementing strategies such as health literacy programs among health care workers. Thus, they can help develop positive attitudes towards the acquisition of self-care habits at work that, in turn, improve their confidence so that health care workers can provide adequate care for their patients and protect themselves.**
- The implications of the findings found could be deepened.
- **Author response: They were deepened in the discussion since we cannot extend much in the abstract.**
- Presentation relevant to the reality of the context studied. It is suggested to deepen the ideas on the justification of the research, with the information presented in the paragraph: "Hence, low levels of knowledge, attitudes and practices (KAP) in regard to the implementation of preventive measures against the disease^{2-6,9} might cause serious public health problems, since health personnel must assume responsibility for care and control of the pandemic.⁷⁻¹⁰".
- Include the objective of the study in the last paragraph.
- **Author response: The introduction was enhanced, taking into account the suggestions.**

Method:

- It is important to describe the health context (pandemic) in which the study participants presented themselves at the time of answering the questionnaire.

- **Author response: It was added.**

Study procedure and tool:

- Include the category "Pandemic-associated factors before" the phrase: "relatives with suspected COVID-19 and physical contact with COVID-19 patients)", e.g. "relatives with suspected COVID-19 and physical contact with COVID-19 patients".
- **Author response: It was added.**

Competing Interests: No competing interests were disclosed.

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