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

Oriana Rivera-Lozada1,2-3, Cesar Augusto Galvez1, Elvis Castro-Alzate4, Cesar Antonio Bonilla-Asalde3

1Unidad de Posgrado de Salud Pública, Universidad Peruana Unión, Lima, Lima, Lima 15, Peru
2Vicerrectorado de Investigación, Universidad Norbert Wiener, Lima, Lima, Lima 32, Peru
3South American Center for Education and Research in Public Health, Universidad Norbert Wiener, Lima, Lima, Peru
4Escuela de Rehabilitación Humana, Universidad del Valle, Cali, Valle Del Cauca, Colombia

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

Invited Reviewers

1

2

version 3
(revision)
10 Nov 2021

version 2
(revision)
20 Oct 2021

version 1

16 Jul 2021

1. Rubia Consuelo Cobo Rendón
Universidad de Concepción, Concepción, Chile

2. Jaime A. Yanez
Universidad Peruana de Ciencias Aplicadas, Lima, Peru

Any reports and responses or comments on the article can be found at the end of the article.
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 attitudes.

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

---

Corresponding author: Oriana Rivera-Lozada (riveraolozada@gmail.com)

**Author roles:** Rivera-Lozada O: Conceptualization, Data Curation, Formal Analysis, Funding Acquisition, Investigation, Methodology, Project Administration, Resources, Software, Supervision, Validation, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing; Galvez CA: Project Administration, Resources, Software, Validation, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing; Castro-Alzate E: Formal Analysis, Funding Acquisition, Investigation, Methodology, Project Administration, Software, Supervision, Validation, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing; Bonilla-Asalde CA: Conceptualization, Data Curation, Formal Analysis, Funding Acquisition, Investigation, Methodology, Project Administration, Resources, Software, Supervision, Validation, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing

**Competing interests:** No competing interests were disclosed.

**Grant information:** The author(s) declared that no grants were involved in supporting this work.

**Copyright:** © 2021 Rivera-Lozada O et al. This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**How to cite this article:** Rivera-Lozada O, Galvez CA, Castro-Alzate E and Bonilla-Asalde CA. Factors associated with knowledge, attitudes and preventive practices towards COVID-19 in health care professionals in Lima, Peru [version 3; peer review: 2 approved] F1000Research 2021, 10:582 https://doi.org/10.12688/f1000research.53689.3

**First published:** 16 Jul 2021, 10:582 https://doi.org/10.12688/f1000research.53689.1
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. 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. 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.

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. 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?

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. 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, it becomes even more critical for any country to overcome this situation and provide care to health professionals at the same time.

Hence, low levels of knowledge, attitudes and practices (KAP) regarding the implementation of preventive measures against the disease can cause serious public health issues, as health personnel must assume responsibility for the care and control of the pandemic. 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. 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 Peru.

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-19 and the questionnaire developed by Bhagavathula et al. 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 ≥ 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.

Regarding the formulation of preventive practices-related questions, these were based on COVID-19 clinical management guidelines by WHO and the Kim and Choi questionnaire. 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 ≥ 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.

The attitude-related questions associated to risk perception were based on Zhang’s questionnaire, 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 ≥ 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.

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 11.9% 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  | 29.8 – 40.7 |
| Female                | 64.9  | 59.3 – 70.2 |
| Age                   |       |             |
| 35 – 49 years old     | 73.5  | 68.5 – 78.8 |
| 50 – 65 years old     | 26.5  | 21.2 – 31.5 |
| Marital status*       |       |             |
| Single/cohabiting     | 12.6  | 9.3 – 16.2  |
| Married/cohabiting    | 87.4  | 83.8 – 90.7 (74) |
| Children              |       |             |
| No                    | 8.6   | 5.6 – 11.9  |
| Yes                   | 91.4  | 88.1 – 94.4 |
| Level of education    |       |             |
| Specialty             | 8.9   | 6.0 – 12.6  |
| Master                | 79.1  | 74.5 – 83.8 |
| Doctorate             | 11.9  | 8.3 – 15.6  |
| Religion              |       |             |
| Non-Catholic          | 19.9  | 15.2 – 24.5 |
| Catholic              | 80.1  | 75.5 – 84.8 |
| Transport             |       |             |
| Private               | 62.3  | 56.6 – 67.5 |
| Public                | 37.7  | 32.5 – 43.4 |
Table 2. Association between epidemiological variables and level of knowledge, practices and negative attitudes.

| Epidemiological Variables | Knowledge | Practices | Negative attitudes |
|---------------------------|-----------|-----------|--------------------|
|                           | Low level (%) | High level (%) | OR (95% CI) | P  | Low level (%) | High level (%) | OR (95% CI) | P  | Low level (%) | High level (%) | OR (95% CI) | P  |
| Gender                    |            |           |           |    |            |           |           |    |            |           |           |    |
| Male                      | 33.6 (76)  | 39.5 (30) | 1 0.77 (0.45-1.13) | 0.356 | 32.4 (67)  | 41.1 (39) | 1 0.68 (0.41-1.13) | 0.142 | 37.6 (71)  | 31.0 (35) | 1 1.34 (0.81-2.20) | 0.245 |
| Female                    | 66.4 (150) | 60.5 (46) |           |      | 67.6 (140) | 58.9 (56) |           |      | 62.4 (118) | 69 (78)   |           |      |
| Age                       |            |           |           |    |            |           |           |    |            |           |           |    |
| 35 – 49 years old         | 74.3 (168) | 71.1 (54) | 1 1.18 (0.66-2.1) | 0.575 | 69.1 (143) | 83.2 (79) | 1 0.45 (0.24-0.83) | 0.01 | 70.9 (134) | 77.9 (88) | 1 0.69 (0.40-1.19) | 0.18 |
| 50 – 65 years old         | 25.7 (58)  | 28.9 (22) |           |      | 30.9 (64)  | 16.8 (16) |           |      | 29.1 (55)  | 22.1 (25) |           |      |
| Marital status*           |            |           |           |    |            |           |           |    |            |           |           |    |
| Single/cohabiting         | 15.9 (36)  | 2.6 (2)   | 1 7.01 (1.64-29.85) | 0.001 | 11.1 (23)  | 15.8 (15) | 0.66 (0.33-1.34) | 0.255 | 13.2 (25)  | 11.5 (13) | 1.17 (0.57-2.39) | 0.66 |
| Married/cohabiting        | 84.1 (190) | 97.4 (74) |           |      | 88.9 (184) | 84.2 (80) |           |      | 86.8 (164) | 88.5 (100) |           |      |
| Children                  |            |           |           |    |            |           |           |    |            |           |           |    |
| No                        | 10.2 (23)  | 3.9 (3)   | 1 2.75 (0.80-9.45) | 0.104 | 7.7 (16)   | 10.5 (10) | 0.71 (0.31-1.6) | 0.42 | 6.8 (15)   | 15.2 (11) | 0.79 (0.35-1.80) | 0.59 |
| Yes                       | 89.8 (203) | 96.1 (73) |           |      | 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)  | 1 1.18 (0.69-2.01) | 0.527 | 80.7 (167) | 78.9 (75)  | 1 1.68 (1.03-2.77) | 0.037 | 77.2 (146) | 85.0 (96)  | 1 1.08 (0.67-1.75) | 0.74 |
| 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 (%) | High level (%) | OR (95% CI) | P  | Low level (%) | High level (%) | OR (95% CI) | P  | Low level (%) | High level (%) | 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        |        | 72.5 (150)| 74.7 (71) | 1        |        | 67.2 (147)| 66.4 (75) | 1    |
| Yes                                      | 84 (68)   | 16 (13)   | 0.47 (0.24-0.92) | 0.027 | 27.5 (57) | 25.3 (24) | 0.89 (0.51-1.54) | 0.89 | 22.8 (43) | 33.6 (38) | 1.72 (1.03-2.88) | 0.039 |
## Table 3. Continued

| Occupational factors | Knowledge | Practices | Negative attitudes |
|---------------------|-----------|-----------|-------------------|
|                     | Low level (%) | High level (%) | OR (95% CI) | P | Low level (%) | High level (%) | OR (95% CI) | P | Low level (%) | High level (%) | 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 (0.87-2.42) |
| 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 (%) | High level (%) | OR (95% CI) | P | Low level (%) | High level (%) | OR (95% CI) | P | Low level (%) | High level (%) | 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) | 1 | 71.0 (147) | 69.5 (66) | 0.93 (0.54-1.57) | 1 | 66.1 (125) | 77.9 (88) | 1.8 | 1.05-3.08 |
| Comorbidity          | | | | | | | | | | | | |
| None                 | 58.0 (131) | 69.7 (53) | 1 | 54.6 (113) | 74.7 (71) | 1 | 64.0 (121) | 55.8 (63) | 1 | 0.1 |
| Diabetes             | 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 |
| Hypertension         | 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 |
| Obesity              | 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 |

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 ≥ 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 1.08-4.22) 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, 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
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

### 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 |
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.37 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.38 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).34 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.14,35

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.,\textsuperscript{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.\textsuperscript{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”.\textsuperscript{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? |      |       |              |
### Questions

| 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

Data are available under the terms of the Creative Commons Attribution 4.0 International license (CC-BY 4.0).

References

1. Elkholy AA, Grant R, Assiri AM, et al.: MERS-CoV infection among healthcare workers and risk factors for death: Retrospective analysis of all laboratory-confirmed cases reported to WHO from 2012 to 2 June 2018. J Infect Public Health. 2020; 13: 418-422. PubMed Abstract | Publisher Full Text | Free Full Text

2. Bhat M, Ghali P, Deschenes M, et al.: Hepatitis B and the Infected Health Care Worker: Public Safety at What Cost? Can J Gastroenterol. 2012; 26: 257-260. PubMed Abstract | Publisher Full Text | Free Full Text

3. Hunter JC, Nguyen D, Aden B, et al.: Transmission of Middle East Respiratory Syndrome Coronavirus Infections in Healthcare Settings, Abu Dhabi. Emerg Infect Dis. 2010; 22: 647-656. PubMed Abstract | Publisher Full Text | Free Full Text

4. Herrera-Alazco P, Uyen-Cateriano A, Mezones-Holguin E, et al.: Some lessons that Peru did not learn before the second wave of COVID-19. Int J Health Plann Manage. 2021; 36(3): 955-958. PubMed Abstract | Publisher Full Text

5. Lainez RH, Salcedo RM, Madariaga MG: COVID-19 infection in the developing world: The Peruvian perspective. Trans R Soc Trop Med Hyg. 2021; 115(9): 941-943. PubMed Abstract

6. Schwartz J, King C-C, Yen M-Y: Protecting Healthcare Workers During the Coronavirus Disease 2019 (COVID-19) Outbreak: Lessons From Taiwan’s Severe Acute Respiratory Syndrome Response. Clin Infect Dis. 2020; 71: 858-860. PubMed Abstract | Publisher Full Text | Free Full Text

7. Ajjilore K, Atokoli I, Oyenankayi K: College students’ knowledge, attitudes and adherence to public service announcements on Ebola in Nigeria: Suggestions for improving future Ebola prevention education programmes. Health Education J. 2017; 76: 649-660. Publisher Full Text

8. Tachfouti N, Slama K, Berraho M, et al.: Some lessons that Peru did not learn before the second wave of COVID-19. Int J Health Plann Manage. 2021; 36(3): 955-958. PubMed Abstract | Publisher Full Text

9. Quispe-Cafiri FJ, Fidel-Rosales E, Manrique D, et al.: Self-medication practices during the COVID-19 pandemic among the adult population in Peru: A cross-sectional survey. Saudi Pharm J. 2021; 29(2): 1-11. Publisher Full Text

10. Tao N: An analysis on reasons of SARS-induced psychological panic among students. Journal of Anhui Institute of Education. 2003; 21: 78-79.

11. Zhang M, Zhou M, Tang F, et al.: Knowledge, attitude, and practice regarding COVID-19 among healthcare workers in Henan, China. J Hosp Infect. 2020; 105(2): 183-187. PubMed Abstract | Publisher Full Text | Free Full Text

12. Gao H, Han NT, Van Khanh T, et al.: Knowledge and attitude toward COVID-19 among healthcare workers at District 2 Hospital, Ho Chi Minh City, Asian Pac J Trop Med. 2020; 13: 260-265. Publisher Full Text

13. Modi PD, Nair G, Uppe A, et al.: COVID-19 Awareness Among Healthcare Students and Professionals in Mumbai Metropolitan Region: A Questionnaire-Based Survey. Cureus. 2020; 12. PubMed Abstract | Publisher Full Text | Free Full Text

14. Saglai M, Munir MM, Rehman SU, et al.: Knowledge, attitude, practice and perceived barriers among healthcare workers regarding COVID-19: A cross-sectional survey from Pakistan. J Hosp Infect. 2020; 105: 419-423. PubMed Abstract | Publisher Full Text | Free Full Text

15. Oylum R, Chekwuch G, Weksha G, et al.: Coronavirus Disease-2019: Knowledge, Attitude, and Practices of Health Care Workers at Makerere University Teaching Hospitals, Uganda. Front Public Health. 2020; 8: 181. PubMed Abstract | Publisher Full Text | Free Full Text

16. Nepal R, Sapkota K, Adhikari K, et al.: Knowledge, attitude and practice regarding COVID-19 among healthcare workers in Chitwan, Nepal. J Hosp Infect. 2020; 105: 183-187. PubMed Abstract | Publisher Full Text | Free Full Text

17. World Health Organization: Emerging respiratory viruses, including COVID-19: methods for detection, prevention, response, and control. 2020. (02-01). Reference Source

18. Bhatapathula AS, Alhdaifiwa WA, Rahman J, et al.: Knowledge and Perceptions of COVID-19 Among Health Care Workers: Cross-Sectional Study. JMR Public Heal Surveill. 2020 Apr 30 [cited 2020 Jun 29]; 6(2): e19160. PubMed Abstract | Publisher Full Text | Free Full Text

19. García Cadena CH, Landero Hernández R, González Ramírez GT: Estadística con SPSS y metodología de la investigación. México: Trillas 2006. (pp. 139–166).

20. Kim JS, Cha JS: Middle East respiratory syndrome-related knowledge, preventive behaviours and risk perception among nursing students during outbreak. J Clin Nurs. 2016; 25(17–18): 2542–9. PubMed Abstract | Publisher Full Text | Free Full Text

21. Zhang M, Zhou M, Tang F, et al.: Knowledge, attitude, and practice regarding COVID-19 among healthcare workers in Henan, China. J Hosp Infect. 2020; 105(2): 183-187. PubMed Abstract | Publisher Full Text | Free Full Text

22. Tsiga-Ahmed FI, Amole TG, Musa BM, et al.: COVID-19: Evaluating the Knowledge, Attitude and Preventive Practices of Healthcare Workers in Northern Nigeria. Int J Med Res Health Sci. 2021; 10(1): 88-97. PubMed Abstract | Publisher Full Text | Free Full Text

23. Perrotta F, Corbi G, Mazzego G, et al.: COVID-19 and the elderly: insights into pathogenesis and clinical decision-making. Aging Clin Exp Res. 2020; 32(3): 1599–1608. PubMed Abstract | Publisher Full Text | Free Full Text

24. Otter JA, Doneck C, Yedli S, et al.: Transmission of SARS and MERS coronaviruses and influenza virus in healthcare settings: the possible role of dry surface contamination. J Hosp Infect. 2016; 92(3): 235–250. PubMed Abstract | Publisher Full Text | Free Full Text

25. Nacer AH, Dahmash EZ, Alshairf ZK, et al.: Knowledge and Practices during the COVID-19 Outbreak in the Middle East: A Cross-Sectional Study. Int J Environ Res Public Health. 2021; 18: 4669. PubMed Abstract | Publisher Full Text | Free Full Text

26. Rani M, Sharma I, Sharma S, et al.: Exploring the knowledge, attitude, and practice of health-care professionals on coronavirus (COVID-19) pandemic infection. J Educ Health Promot. 2021; 10: 115. Published 2021 Mar 31. PubMed Abstract | Publisher Full Text | Free Full Text

27. Desalegn Z, Feyessa N, Teku B, et al.: Evaluation of COVID-19 related knowledge and preparedness in health professionals at selected health facilities in a resource-limited setting in Addis Ababa, Ethiopia. PLoS One. 2021; 16(2): e0244050. PubMed Abstract | Publisher Full Text | Free Full Text

28. Addis SG, Nega AD, Miretu DG: Knowledge, attitude and practice of patients with chronic diseases towards COVID-19 pandemic in Dessie town hospitals, Northeast Ethiopia. Diabetes Metab Syndr. 2021; 15(3): 847-856. PubMed Abstract | Publisher Full Text | Free Full Text

29. Silva JS, Batista de Carvalho AR, Leite HC, et al.: Reflexiones sobre los riesgos occupacionales en trabajadores de salud en tiempos pandémicos por COVID-19. Rev Cubana Enferm. 2020 [citado 22 Jun 2021]; 36(2): [aprox. 0 p.]. Reference Source
30. Rizki SA, Kurniawan J, Budimulia P, et al.: Knowledge, Attitude, and Practice in Indonesian Health Care Workers Regarding COVID-19. Asia Pac J Public Health. 2021; 101053952111018. PubMed Abstract | Publisher Full Text

31. Ramadan M, Hasan Z, Saleh T, et al.: Beyond Knowledge: Evaluating the Practices and Precautionary Measures towards COVID-19 among Medical Doctors in Jordan. Int J Clin Pract. 2021: e14122. PubMed Abstract | Publisher Full Text | Free Full Text

32. Wang J, Zhou M, Liu F: Reasons for healthcare workers becoming infected with novel coronavirus disease 2019 (COVID-19) in China. J Hosp Infect. 2020; 105(1): 100–101. PubMed Abstract | Publisher Full Text | Free Full Text

33. Verbeek JH, Ijaz S, Mischke C, et al.: Personal protective equipment for preventing highly infectious diseases due to exposure to contaminated body fluids in healthcare staff. Cochrane Database Syst Rev. 2016; 4: Cd011621. PubMed Abstract | Publisher Full Text

34. Williams L, Rasmussen S, Kleczkowski A, et al.: Protection motivation theory and social distancing behaviour in response to a simulated infectious disease epidemic. Psychol Health Med. 2015; 20(7): 832–837. PubMed Abstract | Publisher Full Text

35. Mortada E, Abdel-Azem A, Al Shouairy A, et al.: Preventive Behaviors Towards Covid-19 Pandemic Among Healthcare Providers in Saudi Arabia Using the Protection Motivation Theory. Risk Manag Healthc Policy. 2021; 14: 685–694. PubMed Abstract | Publisher Full Text | Free Full Text

36. Dantas F: Resultados terapêuticos da homeopatia em pacientes suspeitos ou confirmados de COVID-19 no Brasil: Protocolo para estudo observacional prospectivo. Resultados terapêuticos da homeopatia em pacientes suspeitos ou confirmados de COVID-19 no Brasil: Protocolo para estudo observacional prospectivo. 2020. p. 46. PubMed Abstract | Publisher Full Text | Free Full Text

37. McEachan R, Taylor N, Harrison R, et al.: Meta-Analysis of the Reasoned Action Approach (RAA) to Understanding Health Behaviors. Ann Behav Med. 2016; 50(4): 592–612. PubMed Abstract | Publisher Full Text | Free Full Text

38. The national institute for occupational safety and health NIOSH: Guidelines for Protecting the Safety and Health of Health Care Workers Revision. 2014. Retrieved June 10, 2020. Reference Source

39. Yesiltug G, Cicek H, Arsl M, et al.: Nurses’ knowledge levels and perceptions regarding occupational risks and hazards. Int J Caring Sci. 2018; 11(2): 1117–1124.

40. Zhang M, Zhou M, Tang F, et al.: Knowledge, attitude, and practice regarding COVID-19 among healthcare workers in Henan, China. J Hosp Infect. 2020; 105(2): 183–187. PubMed Abstract | Publisher Full Text | Free Full Text

41. Maleki S, Najafi F, Farhadi K, et al.: Knowledge, attitude and behavior of health care workers in the prevention of COVID-19. 2020.

42. Abdel Wahed WY, Hefzy EM, Ahmed MI, et al.: Assessment of Knowledge, Attitudes, and Perception of Health Care Workers Regarding COVID-19, A Cross-Sectional Study from Egypt. J Community Health. 2020; 45(6): 1242–1251. PubMed Abstract | Publisher Full Text | Free Full Text

43. Abdelhafiz AS, Mohammed Z, Ibrahim ME, et al.: Knowledge, Perceptions, and Attitude of Egyptians Towards the Novel Coronavirus Disease (COVID-19). J Community Health. 2020; 45(5): 881–890. PubMed Abstract | Publisher Full Text | Free Full Text

44. Maude RR, Jorrdeeppaisal M, Skuntaniyom S, et al.: Improving knowledge, attitudes and practice to prevent COVID-19 transmission in healthcare workers and the public in Thailand. BMC Public Health. 2021; 21(1): 749. PubMed Abstract | Publisher Full Text | Free Full Text

45. Bonilla-Asalde CA, Rivera-Lozada IC, Bonilla-Pizarro DN, et al.: Health sciences students’ competencies in addressing COVID 19: The challenge of returning to clinical practice. Pakistan J Med Heal Sci. 2020; 14(3): 1005–1012.

46. Lozada OR, Bonilla CA: Factors associated with knowledge, attitudes and preventive practices towards COVID-19 in health care professionals in Lima, Peru. 2021. Publisher Full Text
Open Peer Review

Current Peer Review Status: 

Version 2

Reviewer Report 03 November 2021

https://doi.org/10.5256/f1000research.78038.r97525

© 2021 Cobo Rendón R. This is an open access peer review report distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

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

© 2021 Yanez J. This is an open access peer review report distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

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.
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\(^15\),\(^16\),\(^17\),\(^18\),\(^19\)
   ○ Technostress\(^20\)
   ○ 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.

**References**

1. Alvarez-Risco A, Mejia CR, Delgado-Zegarra J, Del-Aguila-Arcentales S, et al.: The Peru Approach against the COVID-19 Infodemic: Insights and Strategies. *Am J Trop Med Hyg.* 2021; 103 (2): 583-586 PubMed Abstract | Publisher Full Text

2. Nieves-Cuervo GM, Manrique-Hernández EF, Robledo-Colonia AF, Grillo AEK: [Infodemic: fake news and COVID-19 mortality trends in six Latin American countries][Infodemia: noticias falsas e tendencias na mortalidade por COVID-19 em seis países da América Latina]. *Rev Panam Salud Publica.* 2021; 45: e44 PubMed Abstract | Publisher Full Text

3. Haraki CAC: [COVID-19 infodemic management strategies in South America][Estrategias adoptadas en América del Sur para la gestión de la infodemia relacionada con la COVID-19]. *Rev Panam Salud Publica.* 2021; 45: e43 PubMed Abstract | Publisher Full Text

4. Quispe-Cañari JF, Fidel-Rosales E, Manrique D, Mascaro-Zan J, et al.: Self-medication practices during the COVID-19 pandemic among the adult population in Peru: A cross-sectional survey. *Saudi Pharm J.* 2021; 29 (1): 1-11 PubMed Abstract | Publisher Full Text

5. Barros-Sevillano J, Sandoval C, Alcarraz-Mundial L, Barboza J: Self-medication in times of COVID-19. A perspective from Peru. *Gaceta de México.* 2021; 157 (1). Publisher Full Text

6. Yáñez J, Chung S, Román B, Hernández-Yépez P, et al.: Prescription, over-the-counter (OTC), herbal, and other treatments and preventive uses for COVID-19. 2021. 379-416 Publisher Full Text

7. Villena-Tejada M, Vera-Ferchau I, Cardona-Rivero A, Zamalloa-Cornejo R, et al.: Use of medicinal plants for COVID-19 prevention and respiratory symptom treatment during the pandemic in Cusco, Peru: A cross-sectional survey. *medRxiv.* 2021. Publisher Full Text

8. Yepes-Pérez AF, Herrera-Calderon O, Quintero-Saumeth J: Uncaria tomentosa (cat's claw): a
promising herbal medicine against SARS-CoV-2/ACE-2 junction and SARS-CoV-2 spike protein based on molecular modeling. *J Biomol Struct Dyn.* 2020. 1-17 PubMed Abstract | Publisher Full Text
9. Yepes-Pérez AF, Herrera-Calderon O, Sánchez-Aparicio JE, Tiessler-Sala L, et al.: Investigating Potential Inhibitory Effect of Uncaria tomentosa (Cat’s Claw) against the Main Protease 3CLpro of SARS-CoV-2 by Molecular Modeling. *Evid Based Complement Alternat Med.* 2020; **2020**: 4932572 PubMed Abstract | Publisher Full Text
10. Burela A, Hernández-Vásquez A, Comandé D, Peralta V, et al.: Chlorine dioxide and chlorine derivatives for the prevention or treatment of COVID-19: a systematic review. *Rev Peru Med Exp Salud Publica.* **37** (4): 605-610 PubMed Abstract | Publisher Full Text
11. Yáñez J, Alvarez-Risco A, Delgado-Zegarra J: Covid-19 in Peru: from supervised walks for children to the first case of Kawasaki-like syndrome. *BMJ.* 2020. Publisher Full Text
12. Coronado Munoz A, Tasayco J, Morales W, Moreno L, et al.: High incidence of stroke and mortality in pediatric critical care patients with COVID-19 in Peru. *Pediatr Res.* 2021. PubMed Abstract | Publisher Full Text
13. Yock-Corrales A, Lenzi J, Ulloa-Gutiérrez R, Gómez-Vargas J, et al.: Acute Abdomen and Appendicitis in 1010 Pediatric Patients With COVID-19 or MIS-C: A Multinational Experience from Latin America. *Pediatr Infect Dis J.* 2021. PubMed Abstract | Publisher Full Text
14. Domínguez Rojas J, Estupiñan Vigil M, Garcés-Ghilardi R, Alvarado-Gamarra G, et al.: [Cross-sectional study of the clinical characteristics and outcomes of children hospitalized with COVID-19 in Lima, Peru]. *Medwave.* 2021; **21** (1): e8107 PubMed Abstract | Publisher Full Text
15. Yáñez JA, Afshar Jahanshahi A, Alvarez-Risco A, Li J, et al.: Anxiety, Distress, and Turnover Intention of Healthcare Workers in Peru by Their Distance to the Epicenter during the COVID-19 Crisis. *Am J Trop Med Hyg.* **103** (4): 1614-1620 PubMed Abstract | Publisher Full Text
16. Yan J, Kim S, Zhang S, Foo M, et al.: Hospitality workers’ COVID-19 risk perception and depression: A contingent model based on transactional theory of stress model. *International Journal of Hospitality Management.* 2021; **95**. Publisher Full Text
17. Huarcaya-Victoria J, Elera-Fitzcarrald C, Crisol-Deza D, Villanueva-Zúñiga L, et al.: Factors associated with mental health in Peruvian medical students during the COVID-19 pandemic: a multicentre quantitative study. *Rev Colomb Psiquiatr.* 2021. PubMed Abstract | Publisher Full Text
18. Ames-Guerrero R, Barreda-Parra V, Huamani-Cahua J, Banaszak-Holl J: Self-reported psychological problems and coping strategies: a web-based study in Peruvian population during COVID-19 pandemic. *BMC Psychiatry.* 2021; **21** (1). Publisher Full Text
19. Boluarte-Carbajal A, Navarro-Flores A, Villarreal-Zegarra D: Explanatory Model of Perceived Stress in the General Population: A Cross-Sectional Study in Peru During the COVID-19 Context. *Front Psychol.* 2021; **12**: 673945 PubMed Abstract | Publisher Full Text
20. Alvarez-Risco A, Del-Aguila-Arcentales S, Yáñez J, Rosen M, et al.: Influence of Technostress on Academic Performance of University Medicine Students in Peru during the COVID-19 Pandemic. *Sustainability.* 2021; **13** (16). Publisher Full Text
21. Rojas Román B, Moscoso S, Chung SA, Limpias Terceros B, et al.: Tratamiento de la COVID-19 en Perú y Bolivia y los riesgos de la automedicación. *Revista Cubana de Farmacia.* 2020; **53** (2). Reference Source
22. Cabezas-Sanchez C, Hurtado-Roca Y, Suárez-Moreno V: Peru to punish bending of clinical-trial rules. *Nature.* 2021; **595** (7869). Publisher Full Text
23. Shrestha S, Khatri J, Shakya S, Danekhu K, et al.: Adverse events related to COVID-19 vaccines: the need to strengthen pharmacovigilance monitoring systems. *Drugs Ther Perspect.* 2021. 1-7 PubMed Abstract | Publisher Full Text
24. Alvarez-Risco A, Del-Aguila-Arcentales S, Yáñez JA: Telemedicine in Peru as a Result of the COVID-19 Pandemic: Perspective from a Country with Limited Internet Access. *Am J Trop Med Hyg.*
25. Curioso WH, Peña-Ayudante WR, Oscuvilca-Tapia E: COVID-19 reveals the urgent need to strengthen nursing informatics competencies: a view from Peru. *Inform Health Soc Care*. 2021; 46 (3): 229-233 PubMed Abstract | Publisher Full Text

26. Javier Silva L, Rosario Pacahuala E: La Telemedicina como herramienta para enfrentar la atención de pacientes durante el contexto de la COVID-19. *Atención Primaria*. 2021; 53 (7).

27. Medina-Gamero A, Sanchez-Pimentel J, Rosario-Pacahuala E: Telemedicina en el currículo médico para la atención a pacientes geriátricos tras la COVID-19. *Revista Española de Geriatría y Gerontología*. 2021; 56 (2): 122-123 Publisher Full Text

**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\(^15,^16,^17,^18,^19\)
› Technostress\(^20\)
› 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 ≥ 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.
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\textsuperscript{2-6,9} might cause serious public health problems, since health personnel must assume responsibility for care and control of the pandemic.\textsuperscript{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 disease2-6,9 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.