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Health Sciences students' competencies in addressing COVID 19: the challenge of returning to clinical practice

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ABSTRACT

Background: the world is facing *Coronavirus* disease (SARS-CoV-2) which means enormous challenges in all areas of human development, including academic fields.
Aim: To determine the association between epidemiological characteristics and competencies in relation to COVID 19 (level of knowledge, risk perception attitudes and preventive practices) in undergraduate students of health sciences at universities in Lima and Callao.
Methods: analytical cross-sectional study, with a sample of 1235 surveys virtually applied composed of four sections, the first about epidemiological characteristics and the following three about competencies. The analysis included the use of frequencies for categorical variables in addition to bivariate statistics, where the association was evaluated through contingency tables using the disparity ratio with its corresponding 95% CI. For statistical significance, the X^2 test was used. Finally, a multiple logistic regression analysis was performed to determine the variables that explain a low level of competencies.
Results: the multivariate logistic regression permitted us to determine epidemiological characteristics that were significantly associated with a low level of competency in addressing COVID-19: belonging to a non-medical professional school (adjusted OR = 7.89, 95% CI 5.70-11.35, p-value < 0.001); having 1-2 years of study (adjusted OR = 5.63, 95% CI 3.51-9.48, p-value = 0. 003); not having received extra-curricular training from university (adjusted OR = 9.95; 95% CI: 6.58-12.36; p-value < 0.001) and not having COVID-19 cases at home (adjusted OR = 3.81; 95% CI: 2.9-4.2; p-value = 0.000).
Conclusion: We determined the epidemiological characteristics that were significantly associated with a low level of competency: belonging to a non-medical school, having from 1 to 2 years of studies, not having received extracurricular training in COVID 19 from the university, and not having cases of COVID at home.
Keywords: Coronavirus Infections; Students, Health Occupations; Health Knowledge, Attitudes And Practice.

INTRODUCTION

After the initial onslaught of *Coronavirus* (SARS-CoV-2), this disease is forcing the world to confront with enormous challenges in all areas of human development, including academia. Education in health sciences does not escape this reality, which is starting a deep and reflection on aspects related to the curriculum and academic content taught as well as the pedagogical mediation used that will forge new forms of relations with patients and communities, placing the social fabric in a global and integrated approach. Responding to this challenge implies understanding and proposing new ways of preparing future health professionals to deal with the uncertainty resulting from pandemics such as the one the health sector and society in general are currently facing[1-5].

The health sector is an important risk group for acquiring the infection since it is at the front line in the fight against COVID 19, hence the need to be adequately prepared. The lessons learned in Wuhan (China), where the pandemic began as a pneumonia of unknown cause, are quite clear in this regard. These showed a high intrahospital transmission at the beginning: about 40% of workers in hospitals in Wuhan suffered the contagion. This figure dropped to 2% when personal protection measures were introduced[6,7].

At the time of writing, official data from Peru's Ministry of Health showed 155,671 confirmed cases of COVID 19 and 4,331 deaths. Lima, the capital city, and Callao, the country's main seaport, accounted for 72% of all cases[8].
In previous pandemics and during the COVID 19 pandemic, there has been evidence that competencies such as knowledge level, risk perception attitudes and preventive practices-KAP in students of higher education, among them students of health sciences, can have a negative impact on the behavior of these communities. Therefore, the understanding of these problems in the training institutions and the strategies they employ to address this situation will be essential to minimize their impact and prevent the risks that they generate. In addition, addressing this problem will help to improve curricular plans, leading to changes in public health content that will contribute to the construction of a critical mass of health professionals with sufficient competencies to provide quality health interventions during a pandemic[6,9].

At this time, students' clinical practice is suspended as a protective measure, this will continue until the pandemic period is declared over and then students will return to hospital environments, although without being sure about their level of knowledge and preparation in terms of risks of contagion, preventive practices and adherence to the use of personal protective equipment.

There exists uncertainty in the university community and families. On the one hand, they understand the importance of practice at health facilities to acquire competencies required to take care of patients. However, on the other hand, there is fear caused by the complexity of the current scenario, which poses additional challenges to addressing COVID 19 pandemic, because there are no precedents or similar experiences in this regard[1,3,7].

In this scenario, health programs students will be exposed to close contact with affected people when returning to practices. Hence, it is required to know what their competencies are at the level of knowledge, risk perception attitudes and preventive practices-KAP for this type of situation, which can involve contagion and affect academic performance. Due to these considerations, the objective of this research is to determine the association between epidemiological characteristics and competencies (level of knowledge, risk perception attitudes and preventive practices) in relation to COVID 19 in undergraduate students of health sciences at universities in Lima and Callao.

METHODS

An analytical cross-sectional study was conducted, with 1235 surveys virtually applied to undergraduate students of health sciences, enrolled in universities in Lima and Callao, in Peru, during March 25 - May 30, 2020. A non-random sample was used, through a non-probability snowball sampling, where students known by the researchers were first contacted. The participation was through an electronic questionnaire on Google Drive ®. Once the instrument was completed, they were invited to recruit other health science students among their contacts and so on, until they completed a sample of 1235 surveys.

Ethical standards were respected throughout the research process, the Institutional Research Ethics Committee of Norbert Wiener University approved the study protocol and informed consent procedures with file No. 088-2020. Before completing the questionnaire, the participants were informed via electronic communication about the purpose of the study and the voluntary nature of their participation; the surveys were anonymous and the data were treated with strict confidentiality.

The questionnaire was composed of four sections and was validated by the judgment of ten experts (pulmonologists, infectologists and epidemiologists), who determined its applicability to health science students in Peru.

The first section was made up of 8 questions and served to measure the population's epidemiological characteristics, including aspects such as age, gender, professional school, type of educational institution where the studies are carried out, time spent at university, training in COVID 19 and contact with cases in the family environment.

The students' competences regarding COVID 19 were measured through the following three aspects: level of knowledge, preventive practices and towards risk perception attitudes. The second section evaluated the level of knowledge of COVID-19 through a 26-question survey that explored aspects such as etiology, symptoms, transmission, diagnosis and prevention. The test scores ranged from 0 to 26 points (correct questions had one point and incorrect or no answers had zero). The scores were converted to percentiles, one percentile ≥ 75% was rated as high knowledge and <75% as low knowledge. The instrument reliability was equal to 0.82 using Cronbach's alpha test. The third section, which served to evaluate preventive practices, was based on the Kim and Choi questionnaire[10], modified by the researchers. Thus, thirteen questions were considered with aspects such as hand washing, social distancing, surface disinfection, use of personal protective equipment, response to possible contagion. The test options were dichotomous, "yes" or "no" and one point was assigned for appropriate preventive practices and zero points for inappropriate preventive practices, the score ranged from 0 to 13 points. One percentile ≥ 75% was rated as high level of preventive practices, and <75% as low level of preventive practices. The instrument had a reliability coefficient equal to 0, 86, which was obtained by using the KR-20 test. The fourth section addressed risk perception attitudes, considering six questions that include aspects such as risk of infection, risk of death, fear of infection, fear of attending classes at the university, fear of attending health care facilities for clinical practices and fear of infecting other household members; the test options were dichotomous, "yes" or "no", and a point was assigned for an affirmative response while zero for a negative response, the score ranged from 0 to 6 points; a percentile ≥ 75% was rated as high level of risk perception and <75% as low level of risk perception; the instrument reliability was equal to 0, 86 and was obtained by using the KR-20 test.

The data were analyzed in three phases. The first phase included descriptive analysis of variables, using frequencies for the categorical variables. The second phase considered bivariate analysis, where the association between the variables was evaluated by means of contingency tables, using the disparity ratio (Odds ratio - OR) with its corresponding 95% confidence interval, for the statistical significance of the contingency tables the X2 test was used. Finally, the third phase performed a multiple logistic regression analysis that allowed us to determine those epidemiological variables that explain a low level of competencies (level of knowledge, risk perception attitudes and preventive practices) in health sciences students. The analyses were performed with the IBM SPSS statistics version 25 program, licensed for Norbert Wiener Private University.

RESULTS

Information was obtained from 1235 respondents. With regard to epidemiological characteristics, 73.5% were women; the median age was 22 years old SD ± 2.5 and 67.6% of the students were 21 years old and older. Medical students accounted for 52.9%; nursing, 26.5% and dentistry, 13.5%. To a lesser extent, medical technology 3.6%, obstetrics 2.1% and nutrition 1.4%. We could observe that 56.8% had 1-2 years of education, 75.9% studied at a private universities and 45.5% had received extracurricular training on COVID 19 from their university. Similarly, 95.8% of students reported not having cases of

Coronavirus in their homes and 81.8% stated that there were no cases in relatives who did not reside in their homes.

According to the level of knowledge of COVID 19, only 57.7% of correct answers were in the percentile ≥75 indicating that the level was high. The responses regarding adequate and rational use of personal protective equipment, characteristics of the coronavirus, generation of immunity and COVID cases management were at the low level (Table 1).

In preventive practices, the data revealed that only 53.8% of affirmative responses were in the percentile ≥75 which indicates high level. The low level responses were aligned with some practices of self-isolation and distancing among people in high risk places: using public transport, shopping less frequently, respecting quarantine, not going out and respecting the distance among people.

Regarding risk perception attitudes, the results revealed that 66.7% of answers were in the percentile ≥75 which indicates high level, most of the student body expressed fear of contagion and transmission of the infection to other family members, as well as fear of returning to face-to-face classes and clinical practices. (Table 2)

The bivariate analysis that associated epidemiological characteristics with the level of knowledge showed that the male gender (OR=5.52, 95% CI 4.18-7.28, p=0.000); being younger than 20 years old (OR=1.78, 95% CI 1.62-1.96, p=0.000); belonging to a non-medical school (OR=2.04, 95% CI 1.62-2.56, p=0.000); time of university studies 1 to 2 years (OR=1.89, 95% CI 1.63-2.20, p=0.000); not having being trained in COVID-19 (OR=9.46, 95% CI 7.20-12.44, p=0.000); not having cases at home (OR=2.27; 95% CI 1.20-4.29, p=0.009); not having cases in relatives (OR=4.28, 95% CI 2.98-6.15, p=0.000) were significantly associated with a **Low Level** of knowledge of COVID-19 (Table 3).

The bivariate analysis, associating epidemiological characteristics with risk perception attitudes, showed that male gender (OR=1.47; CI 95 1.18-1.82; p=0.000); less than 20 years of age (OR=2.31; CI 95 2.03-2.63; p=0.000); belonging to a non-medical school (OR=2.30; CI 95 1.80-2.92; p=0.000); time spent at university from 1 to 2 years (OR=2.19; CI 95 1.71-2.77; p=0.001); not having received extracurricular training from university about COVID-19 (OR=171,7; IC 95 70,25-419,67; p=0,000); not having cases of COVID 19 at home (OR=3,33; IC 95 1,49-7,45; p=0,001); not having COVID 19 cases in relatives who do not reside in the household (OR=4,76; IC 95 3,11-7,30; p=0,000) were significantly associated with a Low Level of risk perception attitudes regarding COVID-19 (Table 4).

The bivariate analysis, associating epidemiological characteristics with preventive practices, identified that the male gender (OR=2.02; 95% CI 1.56-2.60; p=0.000); being under 20 years old (OR=1.89; CI 95% 1.72-2.01; p=0.000); belonging to a non-medical school (OR=5.04; CI 95% 3.96-6.41; p=0.000); time of university studies 1 to 2 years (OR=1.89; CI 95% 1.64-2.19; p=0.000); not having received COVID 19 training (OR=5.07, 95% CI 3.97-6.48, p=0.000); not having cases at home (OR=5.83, 95% CI 2.61-13.04, p=0.000); not having cases in relatives outside the home (OR=4.67, 95% CI 3.28-6.65, p=0.000); were significantly associated with a Low Level of preventive practices regarding COVID-19 (Table 5).

The multivariate logistic regression analysis allowed us to determine the epidemiological characteristics that were significantly associated with a low level of competence (level of knowledge, preventive practices and risk perception attitudes) regarding COVID-19: studying at a non-medical professional school (adjusted OR = 7.89, 95% CI 5.70-11.35, p-value < 0.001); having between 1 and 2 years of studies (adjusted OR = 5.63, 95% CI 3.51-9.48, p-value = 0.003); not having received extracurricular COVID 19 training from the university (adjusted OR= 9,95; IC 95%: 6,58-12,36; p-value < 0.001) and not having cases at home (adjusted OR = 3,81; IC 95%: 2,9-4,2; p-value = 0.000). The multivariate model gave us a coefficient of determination equal to 0,38, which means that the variables, including the final model, explain the 38% of variance of the phenomenon of interest

Table 1. Level of knowledge of COVID-19

Questions	**Percentage of correct answers (0-100%)**
Is COVID 19 a respiratory infection caused by a specie of the Coronavirus family?	85,9
Was the first case of COVID 19 diagnosed in Wuhan, China?	99,7
The origin of COVID 19 is unclear, but it appears to have been transmitted to humans by seafood, snakes or bats	82,1
Are fever, cough and breathing difficulties its common symptoms?	99,1
Is its incubation period up to 14 days with an average of 5 days?	95,9
Can it be diagnosed by a RT-PCR test with samples collected from nasopharyngeal and oropharyngeal swabs or sputum and bronchial lavage?	68,8
Is it transmitted through respiratory droplets such as coughing, sneezing and talking?	97,4
Is it transmitted through close contact with an infected case especially in families?	87,1
Is it transmitted through contacts in crowded places?	98,2
Is it transmitted through contact with surfaces contaminated with the virus?	97,4
Can the disease be prevented by hand washing and personal hygiene?	99,1
In the general population, is a surgical mask useful in preventing infection?	83,8
In the general population, is the N95 respirator useful in preventing infection?	33,2
In health facilities, is only personal protective equipment-PPE (gloves, mask, goggles, face shield and gown) useful?	48,5
At health care facilities, is the N95 respirator useful in preventing infection?	51,5
To prevent infection, people should maintain distance greater than or equal to 2 m	92,1
When managing COVID 19 cases, is it sufficient to use the N 95?	28,8

Is the treatment for the disease defined?	11,5
If symptoms appear within 14 days of direct contact with a suspected case, should the person consult a health care facility?	18,5
Are COVID-19 and SARS-Cov-2 the same diseases?	40,3
Are the main vulnerable groups the people older than 60 years old with comorbidity?	97,1
Will the survival time of coronaviruses on surfaces depend on the type of surface, temperature or humidity of the environment?	80,9
Will the survival time of coronaviruses on surfaces depend on the use of bleach or soap?	83,8
Is the survival time of aerosolized coronaviruses in the environment three days?	42,6
Does COVID 19 disease create immunity and protection for future infections?	40,9
Is coronavirus an RNA virus?	48,8
Percentage of correct answers **n (%)**	**Category**
≥75 721 (57,7)	High level
< 75 529 (42,3)	Low level

Table 2: Preventive practices and risk perception attitudes regarding COVID-19

Questions	**%age of Yes answers (0-100%)**
Did you reduce the use of public transport when travelling?	49,2
Did you go shopping less frequently?	35,3
Do you avoid touching your face, nose and mouth with your hands?	97,6
Do you avoid places where there are a great number of people gathered?	38,4
Have you increased the frequency of cleaning and disinfection of objects that are easily touched with hands?	87,6
Have you increased the frequency of cleaning and disinfection of surfaces that can be easily touched?	97,6
Do you wash your hands with water and soap more frequently than you used to?	98,5
Do you use the surgical mask when going out?	98,2
Do you respect the quarantine by not going out to the street?	58,8
Do you respect the 2-meter distancing among people?	67,9
Did you discuss COVID-19 prevention measures with your family and friends?	58,9
If you suspected that you have COVID-19, would you self-isolate?	68,5
If you suspected that you have COVID-19, would you go to the closest health facility or communicate with the telephone operators by calling 113.	69,5
Percentage **n (%)**	**Category**
≥75 673 (53,8)	High level
<75 577 (46,2)	Low level
Risk perception	
As a student of health sciences, can you get infected with COVID more rapidly than others?	72,9
As a student of health sciences, could you die if you got COVID-19?	62,4
Are you afraid of getting infected with COVID-19?	87,1
Are you afraid of attending to face-to-face classes at university?	78,8
Are you afraid of going to a health facility for your clinical practice?	77,1
If you went to your clinical practices at health facilities, would you be afraid of infecting other members of your family?	95,1
Percentage **n (%)**	**Category**
≥75 834 (66,7)	High level
<75 416 (33,3)	Low level

Table 3. Epidemiological characteristics associated with level of knowledge

Epidemiological characteristics	**High level Knowledge (n=721)**		**Low level Knowledge (n=529)**		**OR Confidence intervals 95%**	**p value**
	n	**%**	**n**	**%**		
Gender						
Female	628	68,3	291	31,7	5,52	0,000
Men	93	28,1	238	71,9	(4,18-7,28)	
			Age			
Up to 20 years old	122	30,1	283	69,9	1,78	0,000
21 or older	599	70,9	246	29,1	(1,62-1,96)	
Professional School						
Medical	435	65,8	226	34,2	2,04	0,000
Non-medical	286	48,6	303	51,4	(1,62-2,56)	
Time of University studies						
1 to 2 years	332	46,8	378	53,2	1,89	0,000
3 years or more	389	72,0	151	28,0	(1,63-2,20)	
Type of university						
Private	536	56,5	413	43,5	1,17	0,127
Public	185	61,5	116	38,5	(0,95-1,434)	
COVID 19 training						

Yes	478	84,0	91	16,0	9,46	0,000
No	243	35.7	438	64,3	(7,20-12,44)	
Cases at home						
Yes	39	75,0	13	25,0	2,27	0,009
No	682	56,9	516	43,1	(1,20-4,29)	
Cases in relatives who do not live with you						
Yes	187	82,4	40	17,6	4,28	0,000
No	534	52,2	489	47,8	(2,98-6,15)	

Table 4: Epidemiological characteristics associated with the risk perception attitude on COVID-19

Epidemiological characteristics	**Risk perception Attitudes - High level (n=834)**		**Risk perception Attitudes – Low level(n=416)**		**OR Confidence Intervals 95%**	**P value**
	n	**%**	**n**	**%**		
Gender						
Female	587	63,9	332	36,1	1,47	0,004
Male	247	74,6	84	25,4	(1,18-1,82)	
Age						
Up to 20 years old	139	34,3	266	65,7	2,31	0,000
21 or older	695	82,2	150	17,8	(2,03-2,63)	
Professional School						
Medical	498	75,3	163	24,7	2,30	0,000
Non-medical	336	57,0	253	43,0	(1,80-2,92)	
Time of University studies						
1 or 2 years	527	74,2	183	25,8	2,19	0,001
3 years or more	307	56,9	233	43,1	(1,72-2,77)	
Type of university						
Private	634	66,8	315	33,2	1,02	0,96
Public	200	66,4	101	33,6	(0,77-1,33)	
COVID-19 training						
Yes	564	99,1	5	0,9	171,7	0,000
No	270	39,6	411	60,4	(70,25-419,67)	
Cases at home						
Yes	45	86,5	7	13,5	3,33	0,001
No	789	65,9	409	34,1	(1,49-7,45)	
Cases in relatives who do not live with you						
Yes	201	88,5	26	11,5	4,76	0,000
No	633	61,9	390	38,1	(3,11-7,30)	

Table 5: Epidemiological characteristics associated with preventive practices regarding COVID-19

Characteristics	**Preventive practices- High level (n=673)**		**Preventive practices- Low level N=577**		**OR Confidence Intervals 95%**	**p Value**
	n	**%**	**n**	**%**		
Gender						
Female	537	58,4	382	41,6	2,02	0,000
Male	136	41,1	195	58,9	1,56-2,60	
Age						
Up to 20 years old	91	22,5	314	77,5	1,89	0,000
21 or older	582	68,9	263	31,1	(1,72-2,01)	
Professional School						
Medical	475	71,9	186	28,1	5,04	0,000
Non-medical	198	33,6	391	66,4	(3,96-6,41)	
Time of University studies						
1 or 2 years	301	42,4	409	57,6	1,89	0,000
3 years or more	372	68,9	168	31,1	(1,64-2,19)	
Type of university						
Private	507	53,4	442	46,6	1,05	0,601
Public	166	55,1	135	44,9	(0,86-1,28)	
Extracurricular COVID-19 training						
Yes	424	74,5	145	25,5	5,07	0,000
No	249	36,6	432	63,4	(3,97-6,48)	
Cases at home						
Yes	45	86,5	7	13,5	5,83	0,000
No	628	52,4	570	47,6	(2,61-13,04)	
Cases in relatives who do not live with you						
Yes	184	81,1	43	18,9	4,67	0,000
No	489	47,8	534	52,2	(3,28-6,65)	

DISCUSSION

The COVID 19 pandemic is no longer a health problem in other latitudes and has become a reality in Peru, as well as in other countries in the continent. This situation, in addition to instilling fear and highlighting critical conditions in health systems, affected the academic conditions of health sciences students with the suspension of classes at the university and the practices at health facilities. For the Institutions of Higher Education, this situation is relevant considering the impact on the well-being perceived in the academic community and the increase in academic permanence.

Throughout history, epidemics and pandemics have been documented. Among them, the "Spanish flu" that caused the death of approximately 20 million people in 1918, with global socio-economic and political consequences. Based on the lessons learned, we now know about preventive and control actions to deal with viruses, as well as efforts to understand their nature, challenging public health decision-making to ensure optimal use by health professionals, technicians and students[5,11-15].

Traditionally, health sciences education systems mainly consider classroom teaching for the first two years, after that, it is transferred to the clinical setting. The SARS-Cov-2 pandemic has caused dramatic changes in teaching, and in Peru, since the first cases appeared, face-to-face classes were suspended and were replaced by digital platforms, which before the pandemic had not been further developed. In this context, universities face a challenge that encourage innovation, institutional transformation and improvement of academic conditions. This situation requires a new relationship with the student body and the environment. The crisis shows the need to transform the current educational model, directing efforts towards the promotion of competencies among teachers and students, who make efficient and rational use of academic resources, as well as pedagogical mediation with ICTs that favor the understanding and apprehension of knowledge, preventive practices and risk perception[16-20].

Improving health students' competences to respond to COVID 19 will help reduce their vulnerability by decreasing the risk of infection when returning to clinical practices. Students require a range of competences to ensure timely and effective response to the pandemic, preventing risks of exposure. Because of this, it is essential to know the competencies of the student body in order to achieve clarity in the educational process with precise criteria that ensure educational efficiency, efficacy and effectiveness[21,23].

The COVID 19 pandemic is providing clear lessons for health science professionals, educators and students, such as the fact that aspects related to public health should not be neglected as a fundamental part of curricular plans. Therefore, the evidence generated is important, taking into account that it will serve to improve competencies, which will foster the understanding and improving of the quality of interventions during a pandemic[17,19].

Studies on knowledge, attitudes and practice conducted in China, the Philippines and Saudi Arabia[24-26], included women with the same high level of knowledge in their total sample as in this research. In addition, in the first study, multiple linear regression analysis showed that the male gender (vs. female, β:-0.284, p <0.001) was significantly associated with a lower knowledge score), similar to this study, which also found that men had low risk perception attitudes (OR=1.47, 95% CI 1.18-1.82, p=0.004) and preventive practices (OR=2.02, 95% CI 1.56-2.60, p=0.000), which could occur due to the fact that the majority of the population in this study are women.

Zhong et al. [24] found a high rate of knowledge of COVID 19 among the general population in a study in China, which was unexpected since it was conducted at the beginning of the pandemic in that country, although the explanation they found was that 82.4% of the study sample had a university degree. The authors acknowledged that much of this knowledge of the disease was obtained from various mass communication channels, including the official website of the National Health Commission of China. In this regard, it was surprising that in our study 42.3% had a low level of correct answers, having into account that at the time of information collection the country was on the 85th day of the first confirmed imported case of COVID 19. However, this could be explained by the fact that 56.8% had between 1 and 2 years of education and, probably, little training in public health aspects. Another striking aspect is that, despite the fact that non-face-to-face classes for higher education students had already begun in Peru at that time, only 45.5% admitted having received extracurricular training from their university regarding COVID 19.

A study by Akan et al[27] on university students' knowledge and attitudes towards pandemic influenza in Turkey showed that risk perception among health science students was significantly lower than other sciences' students p = 0037 and, within that study group, 72.1% indicated that their source of information was the media. In our study, we identified that medical training provides elements to ensure a higher level of knowledge in the area. The students and their teachers' approach to pathology, both in theoretical terms and in the scenario of professional practices could explain what is stated lines above. According to Bell-Castillo et al., these approaches should be oriented towards training health professionals from a perspective based on integrated preventive development, going beyond the current health emergency to develop professional competencies that involve permanent updating[28].

In this research, a situation to highlight is that, although 95.8% of students reported not having cases at home and 81.8% stated that there were no cases in relatives who did not reside at their homes, the study showed a high level of response in those questions about risk perception attitude, which expressed fear of being infected, fear of returning to academic activities both in the classroom, as well as clinical practices and fear of infecting other family members. In this regard, although it was not the objective of the study, a study carried out in Peru identified that social networks, television, friends and family produce fear and anxiety by spreading erroneous and exaggerated information, which could explain this situation[29]. Another worrying feature in this regard is that the bivariate analysis showed that the absence of cases of

COVID 19 in the home and in relatives outside the home was associated with low level of knowledge, risk perception attitudes and preventive practices. That could have caused a perception of remoteness of the disease and, therefore, may influence the decision to obtain updated information with an adequate level of evidence. Of course, this is merely speculative, since it was not the objective of the study and is susceptible of being taken as an object of study in future research.

Knowledge of identification and isolation of suspect cases, risk perception and prevention practices, expressed in good hand washing practices, use of personal protective equipment and isolation of infected cases, is a major barrier to preventing COVID 19 transmission[30,31]. Van et al[32], on the behavior of university students towards the H1N1 pandemic, argued that a balance must be maintained between academic continuity and infection control, minimizing morbidity in a pandemic, and highlighting that, after the media coverage of the event, there is a significant increase in anxiety. They also found a high proportion of students who indicated that they would attend college with symptoms, so they recommended that continuing education activities on the importance of infection control should be implemented when there are high anxiety rates and low risk perception.

Lifestyle changes as a result of the pandemic are among the main challenges in university education processes, including in health sciences. Seale et al. e [33], identified hand washing as the most feasible practice to perform compared to personal distancing and mask use in university students outside health sciences against seasonal and pandemic influenza. Those results are consistent with the findings in our study, with the difference that in ours the students belonged to health sciences. This fact highlights the need to strengthen the competencies of future health professionals by disseminating educational content through the available channels that will help to improve their knowledge level competencies, risk perception attitudes and preventive practices, especially the use of personal protective equipment, compliance with personal distance measures and quarantine actions. The most important aspect of the study is that the low levels of knowledge were aligned with a low level of risk perception attitudes and preventive practices, especially in the area of infection control, as observed in the multivariate logistic regression, where the epidemiological characteristics that were significantly associated with a low level of competence (level of knowledge, risk perception attitudes and preventive practices) were determined. Therefore, there should be an educational emphasis on the non-medical health sciences professional schools, on students who are in their two first years of study, increasing extracurricular contents that provide quality information on COVID 19 and providing mental health support especially to students who, despite not having had any cases of COVID 19 in their homes, have reported fear of contagion in their families, as well as fear of returning to classes and clinical practices.

Zhong et al[24], mentioned that higher knowledge scores on COVID 19 were significantly associated with a low likelihood of negative attitudes and potentially dangerous practices towards the epidemic, which indicates the need to improve knowledge of COVID 19.

At this point, it is clear that the health system will have to implement a series of clinical, epidemiological, health management and public health aspects; not to mention other governmental measures in terms of social and economic interventions to reactivate communities. However, what is not clear is the impact of the disease on health science education [34-39]. This is why the real students' competencies to deal with the pandemic was studied, because their results permitted analyzing a series of weaknesses, which will help university authorities to take corrective measures when they return to clinical practices.

This research had some limitations in terms of the exclusive participation of health students. In addition, it did not investigate other sources of information such as the media and/or social networks on COVID 19. Another limitation was related to the use of a non-probability sampling method that prevents extrapolating the results to the entire university's health sciences population.

CONCLUSION

In conclusion, the results of the study allowed us to determine that the epidemiological characteristics that were significantly associated with a low level of competence expressed through its components (level of knowledge, risk perception attitudes and preventive practices) were: belonging to a non-medical health science school, having 1-2 years of education, not having received extracurricular training regarding COVID 19 from the university, and not having COVID cases at home.

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