

Medical Students' Perception Towards the COVID-19 Pandemic in Mexico: Distance Learning, Assisting Hospitals, and Vaccination

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Abstract

Background: Mexico has been one of the most affected countries by the COVID-19 pandemic. Its health workers are playing a substantial role, but they are suffering from a high mortality rate, which highlights the need of prioritizing them for vaccination. Medical interns have reduced their practices, some continue to assist clinical rotations without the necessary protective equipment, and they are not being considered for vaccination. We wanted to determine the attitude of medical students and interns towards distance learning, assisting hospitals, and vaccination. **Methods:** We conducted a paired survey of a cohort of medical students who were evaluated twice, in June 2020 and in December 2020, using an online survey (32-online questions) to assess their perception of the pandemic. **Results:** We collected responses from 384 students in the summer period and 331 in the winter period; the majority were women from non-clinical semesters, and the median age of response was 21 years old (IQR 19 – 22). We found that the percentage of acceptance for vaccination was 95.6% in the summer and 93.7% in the winter, a remarkable acceptance in both periods. The percentage of students who reported having someone close to them with symptoms suggestive of COVID-19 was 38.5% in the summer, showing an increase to 77.6% in the winter. **Conclusion:** We observed that medical students had a positive attitude towards vaccination and that the probable COVID-19 cases among them have increased in just a few months.

Key Words: SARS-CoV-2; COVID-19; Vaccine (Source: MeSH-NLM).

Introduction

Mexico has suffered significantly during this pandemic, being the 3rd country with the highest mortality caused by COVID-19.¹ Mexican health care workers (HCW) are playing a substantial role in treating the virus, but they are one of the most affected populations.² Being a HCW is associated with higher odds of acquiring COVID-19, and with a higher mortality rate from the disease.³

Medical interns, medical students assisting to a rotating internship during their last years of their medical education, are critical as they attend to patients in hospitals and clinics, thereby preventing a breakdown of the national health care system. However, some medical interns are no longer assisting because of the pandemic.⁴ This threatens their education, as well as the capacity of the health system.

In December 2020, Mexico started vaccinating COVID-19 first-line HCW.⁵ Nevertheless, politicians and teachers have been vaccinated before them,^{6,7} while the medical interns are not being considered. The national vaccination plan has been criticized for a “politicization” of the COVID-19 vaccine.⁸ Until January 2021, Mexico was listed below the first 10 positions of vaccination per 100 people, being the country #19.⁹

The way of learning for the medical interns has radically changed due to the pandemic. Many schools opted for distant learning methods, and to reduce their clinical practices. The University Hospital “Dr. José

Eleuterio González” from the *Universidad Autónoma de Nuevo León* (UANL) suspended the first two years of its three-year medical internship, only continuing with the final year students, who have also reduced their practices. The rest of the students had no contact with the patients.¹⁰

We wanted to determine how the medical students and interns feel about distance learning, practices in hospitals, and vaccination, as well as attitudes towards the pandemic management.

Methods

The study was carried out among the medical student population of the *Universidad Autónoma de Nuevo León* (UANL). Medical interns in our hospital are those medical students who assist to a rotating internship during their final years of the education, while the students from the basic semesters belong to the first three years of the program and do not have clinical activities. Generally, the Mexican medical schools require just the medical students from the final year of the career to assist to the rotating internship, so our institution is an exception, and the reason for this is that it is a university teaching hospital where training starts earlier.

Students were evaluated twice, in June 2020 and in December 2020, using an online survey (32-online questions), and their responses were compared. We chose the month of December for the second period

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because Mexico was going to start its vaccination program that month.¹¹ The inclusion criteria for the study were to be a student from UANL medical school, be studying in any semester from the first to the twelfth, to give informed consent, and to be over 18 years old. Exclusion criteria were students at the medical school who were in their social service year -a service that is provided after having finished the career- and students who did not complete the survey and/or did not permit us to share the obtained data.

The 32-questions online questionnaire consisted of sociodemographic questions including age, city, semester, and gender, among others. We also asked for their affinity towards vaccination, use of unapproved medication, if they or someone close to them has had symptoms of COVID-19, fears about the pandemic, and affinity towards the distribution of information about the pandemic situation by the government. The questionnaire was proposed by the authors and was not validated. In most of the questions "yes" or "no" were the responses. The minimum sample size required to have a 95.5% confidence level, a margin of error of 5%, and heterogeneity of 50%, was calculated to be 366 students.

We shared the survey among the institutional student groups in the Microsoft Office Forms platform, and we closed the survey when 500 students had completed it. The students were invited to participate voluntarily, signing the corresponding informed consent. No economic material or academic compensation was offered. The students were evaluated twice with the same survey in two periods: summer period in June 2020 and winter period in December 2020. In the winter period a question was added regarding whether the students have become more interested in their relatives. In the winter period, the survey was only sent to the students who answered during the summer period.

For the statistical analysis, the studied sample was divided into 2 groups to address both periods (summer and winter). To identify the type of distribution of the variables, we used the Kolmogorov-Smirnov test. Continuous variables were represented by mean or median and interquartile index (IQR), and categorical variables as frequencies and percentages. Differences between nonparametric quantitative variables were evaluated with the Mann-Whitney U statistical test, and categorical variables were evaluated using the χ^2 -squared test or Fisher's exact test. A p-value of <0.05 was considered significant. The statistical analysis was performed using SPSS v.25.

Results

In the summer period, from the 500 responses, 384 students (79.5%) gave consent and were included in the study. The majority were women from basic science semesters, and the majority were residing in Monterrey, Mexico. The median age was 21 years old (IQR 19 - 22). In December, the total number of participants was 331 (86.2% from those who participated in summer), the median age remained the same, and the majority continued to be women, from 61.5% to 68.6% (only 9 women left the follow-up study). The percentage of students belonging to clinical semesters remained similar. The percentage of students outside the metropolitan area of Monterrey went from 23.4% to 17.2%. We found that the percentage of acceptance to the vaccination was 95.6% (N=367/384) in summer and 93.7% (N=310/331) in winter, showing a remarkable acceptance in both periods. It should be noted that in our population we found an important increase in the probable number of positive cases because the percentage of students who reported having someone close to them with symptoms suggestive of COVID-19 or stated that they were the symptomatic person was 38.5% (N=148/384) in the summer, increasing to 77.6% (N=257/331) in the winter (p-value <0.001). Those most affected by symptoms were the family, which had the highest increase in cases, followed by the symptoms in oneself. Among other results, the number of students that were following the national informs about COVID-19 decreased but not in a significant way from 83.3% to 80.4%. The percentage of students who believe in what they inform went from 70.6% to 80.4%. Finally, a

loved one getting sick is one of the biggest fears in 90% of the students. Other variables can be seen in **Table 1**.

Table 1. Comparison between summer and winter respondents.

Variable	Summer N=384 (%)	Winter N=331 (%)	p-value
Age (Q1-Q3)	21 (19 - 22)	21 (19 - 22)	0.190*
Medical Interns (7th-12th)	154 (40.1)	134 (40.5)	0.918
Basic semester (1st -6th)	230 (59.9)	197 (59.5)	0.918
Female students	236 (61.5)	227 (68.6)	0.047
Foreign students	90 (23.4)	57 (17.2)	0.040
Which of the following has had COVID-19 symptoms?			
Family	70 (18.2)	149 (45)	<0.0001
Friend	44 (11.5)	51 (15.4)	0.121
Couple	2 (0.5)	5 (1.5)	0.259
You	32 (8.3)	52 (15.7)	0.002
None	236 (61.5)	74 (22.4)	<0.0001
Have you been following the national coverage about COVID-19?			
Yes	320 (83.3)	266 (80.4)	0.303
Do you believe in them?			
Yes	271 (70.6)	266 (80.4)	0.003
Do you believe that it was needed more information about vaccination in the national informs about COVID-19?			
Yes	285 (74.2)	307 (92.7)	<0.0001
Would you use non-approved medications to avoid getting sick or to treat yourself in case of getting sick of COVID-19?			
Yes	45 (11.7)	52 (15.7)	0.120
Do you believe that vaccination should be mandatory?			
Yes	336 (87.5)	280 (84.6)	0.262
What are your three biggest fears during COVID-19 pandemic?			
A loved one getting sick.	343 (89.4)	301 (92.1)	0.472
Getting infected and infecting a loved one.	305 (79.4)	287 (86.7)	0.010
The economy of the family.	280 (72.9)	258 (77.9)	0.120
Have you struggled to study?			
Yes	199 (51.8)	258 (77.9)	<0.0001
Have you become more interested in the people that matter to you?			
Yes	-	259 (78.2)	

Legend: *Mann-Whitney U test was used to analyze this variable.

Discussion

The curriculum of medical students varies throughout the world however, they all point in the same direction: developing the best skills of medical students to satisfactorily serve the patients. The first years of the education program correspond to the theoretical part of medicine, while in the final years the students integrate to hospitals and health centers, so they can learn about various medical specialties. Nevertheless, the COVID-19 pandemic has affected the theoretical and practical education of medical students all over the world.^{12,13}

Many schools have implemented extraordinary options for students' best learning, for example, Garman *et al*¹⁴ reports that students can participate through telecommunication to connect with patients and assist them. In our study, we found that by the winter period the 77.9% of medical students found it hard to study their subjects. We fear that

the pandemic could affect their knowledge and their interest in the career. New measures need to be taken by medical schools to help them.

Clinical practices are important to gain professional skills and to help our national health system, but Mexico has not been able to guarantee the protection of interns, which can play a crucial role when addressing the community needs in the COVID-19 pandemic.¹⁵ In Mexico, some of them continue assisting hospitals as reported by Corte *et al*¹⁶ where 16.14% of medical residents (the postgraduate training for becoming a specialist) claimed they still counted on the support of the medical interns. This may represent a threat to them because they have a high risk of getting infected or even dying.¹⁷ We found an increase in the percentage of a probable number of positive cases among the medical students from summer to winter. If they are required to assist to health centers, then they should be vaccinated and protected with adequate equipment. Lack of personal protective equipment is a common cause of death among the HCW's especially in low-and middle-income nations.¹⁸

Providing final-year medical students the opportunity to graduate early to compensate for staff shortages during this crisis could be an effective strategy. Countries such as the United States have carried out this strategy with success.¹⁹ In Mexico we could offer this option to the medical interns, but this needs to be voluntary, well paid, and with the proper use of personal protective equipment, otherwise ethical concerns may arise.

There are multiple ways by which medical students can be of assistance during this pandemic to gain professional experience and support our national health system. They can volunteer in primary healthcare centers, swab collection points, or hospitals to be engaged in low-risk activities.^{20,21} Also, students can help by raising people's awareness of the COVID-19 pandemic or informing the elderly about the preventive measures. Most of our students followed the national informs about COVID-19, and would not consider non-approved drugs for COVID-19 treatment, meaning that they are being correctly informed and that they encourage an evidence-based approach of the COVID-19 disease. This can help their friends, family, and other people to be correctly informed. Turning to medical research and innovation to understand the pandemic and create solutions is another task in which a medical student can be engaged.²¹

The thoughts of the medical students that we found the most in our study included fears of being infected, fears of getting sick, and fears

that a loved one gets sick. A previous study proves that there are increasing levels of anxiety due to COVID-19 among medical students, especially in female students, and in those who continue to assist to clinical rotations.²² Enhancing medical students' health literacy skills reduces fear and improves their mental health because they can have access to health information during this pandemic for protecting their personal health and that of people they love.²³

The next step to take during the COVID-19 pandemic is the vaccination of the HCWs and medical interns. In our study, the medical students appeared to be willing to be vaccinated in both periods, so they may be hoping that will happen soon. This desire becomes unlikely to happen in the next months if we consider the measures taken by the Secretary of Health of Mexico to control the pandemic, which has been strongly criticized. The main reasons are the lack of protection for the health personnel,² the limited amount of PCR tests made,¹ and a vaccination strategy that does not prioritize health personnel.⁵

To face the problem, the authors, especially those who are in their senior year have been closely involved in a series of demands seeking the vaccination of the medical interns as a priority. By March 2021, we showed the results of our research to the university authorities, started a work stoppage, and protested in front of the medical school. The final results were the registration of the medical interns in the national immunization registry for COVID doctors, ensuring of adequate protective equipment, and reduction of working hours.²⁴

This study has many strengths, including size, a representative ratio of men to women, and good response rate for follow-up. Limitations of this study can be its descriptive methodology, and that we do not know how seriously the online survey was taken. The limitations can be addressed through in person surveys when the face-to-face classes become a reality, allowing expanding our results and conclusions.

In conclusion, we observed that the interns and medical students struggled to study their subjects, had a positive attitude towards vaccination, and that the probable COVID-19 cases among them and their family have increased in just a few months. Our results highlight the importance of prioritizing medical students in clinical years in vaccination strategies alongside or immediately after the other HCW due to their importance in teaching models and community clinical practice in university hospitals.

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