

**ORIGINAL ARTICLE**

## COVID-19 Vaccines: Pharmacy Student Virtual Education Outreach Increases Knowledge and Vaccine Willingness among a College Campus Community

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**Abstract**

**Objectives:** Vaccines have now been developed, however, a significant portion of the population are reluctant to become vaccinated. Research shows that education can increase trust in vaccines and increase vaccination rates. Thus, the objective of the study was to determine the impact of a virtual pharmacy student-led educational session on COVID-19 vaccine knowledge and vaccine acceptance among a college campus community.

**Methods:** A synchronous Zoom education session provided information about COVID-19 and available vaccines. Study participants were students and employees of a college campus community recruited via university-wide advertisements and social media platforms. Pre-tests and post-tests, composed of true or false based questions, were utilized to assess participant knowledge and vaccine willingness before and after the educational presentation. Participant engagement involved answering and asking questions via the Zoom chat feature or unmuting their microphones.

**Results:** 131 and 100 subjects completed the pre- and post-surveys, respectively. Results confirmed that the educational session improved knowledge regarding the vaccines and likelihood of vaccination. The number of knowledge-based questions that were answered correctly increased from 55.4% to 86.6% post presentation. There was an 8% increase in those willing to get vaccinated as soon as eligible. There was a 16% increase in the number of those who agreed that they would encourage others to get vaccinated with only 6% who disagreed in doing so.

**Conclusion:** The results suggest that a virtual educational session presented by student pharmacists was able to improve knowledge regarding COVID-19 disease and vaccines,

increased likelihood of vaccination, and increased willingness to encourage others to get vaccinated among a college campus. Pharmacy students or other healthcare students may be an untapped resource to educate the public about COVID-19 vaccines.

**Keywords**

SARS-Cov-2, Virus, Infectious disease, Public health, Vaccine hesitancy, Vaccine acceptance

**Introduction**

COVID-19 (coronavirus disease 2019) has become the deadliest pandemic in U.S. history and was the third leading cause of death in 2020, behind heart disease and cancer [1]. By the middle of March of 2020, the virus had spread to 110 countries and the World Health Organization officially declared a pandemic. The viral outbreak is believed to have originated in China in late 2019 and spread to the United States in early 2020. The first known U.S. death from COVID-19 was reported in February of 2020. To slow the spread of the virus, since March 2020 there have been varying degrees of preventative strategies employed in the U.S. including shut-down of public places, testing, contact tracing, quarantining, social distancing, and mask wearing [1]. However, these measures were not sufficient to end the COVID-19 pandemic.

In December 2020, COVID-19 vaccines became available in the U.S. under emergency use. The national

vaccination program outlined how the vaccines would be dispersed to the U.S. population and a vaccination schedule based primarily on age and risk. Some of the first persons eligible for a COVID-19 vaccine were healthcare providers and the elderly. Lowest on the priority list were young healthy individuals. Reaching herd immunity via vaccination is the safest and most effective means to end the pandemic.

Despite the availability of safe and effective vaccines, there exists much vaccine hesitancy, making it difficult to reach herd immunity in the U.S. In anticipation of the COVID-19 vaccines, the results from a poll taken in May 2020 determined that only 50% of Americans reported that they would get a vaccine when available; approximately 30% were unsure and approximately 20% would refuse a vaccine [2]. Another survey taken in April 2020, 57.6% of respondents reported that they were intending of getting a vaccine while 31.6% were unsure and 10.8% would refuse [3]. As of October 15, 2021 only 57% of the U.S. population was fully vaccinated; in North Carolina 52% were fully vaccinated. At this time, all individuals 12 years and older were eligible. Vaccine hesitancy has been found to be more associated with younger age, black race, lower educational attainment, political affiliation, and perceived threat of getting infected with COVID-19 in the next one year [4]. The speed of development of the vaccines, political influences, and spread of misinformation regarding the vaccines on social media have negatively impacted COVID-19 vaccine acceptance [2,5,6].

To improve vaccine acceptance among a college campus community in North Carolina, in March of 2021 an educational session regarding the COVID-19 vaccines was implemented to educate the community about their safety and effectiveness, the importance of receiving a vaccine, and to combat misinformation and myths circulating on social media. Due to social distancing guidelines and the concern for the spread of the virus, a synchronous virtual venue was explored. Furthermore, it was not known whether the campus community would respond positively toward student pharmacists as the educators rather than fully degreed and licensed health care professionals. Thus the objective of the study was to determine the impact of a virtual pharmacy student-led educational session on COVID-19 vaccine knowledge and vaccine acceptance among a college campus community.

## Methods

Five second year pharmacy students provided a synchronous virtual Zoom education session to students, staff, and faculty among a college campus community in March of 2021. The university is a small private liberal arts school with its main campus located in rural North Carolina approximately 30 miles outside of Charlotte. It serves approximately 3400 students, both undergraduate and graduate. The campus community

was recruited via university-wide advertisements and social media platforms. The education session consisted of a PowerPoint presentation followed by sharing of personal experiences of receiving the vaccines themselves by the student pharmacists. The objectives of the educational session were: 1. To explain COVID-19 and its impact on the community, 2. To describe the safety, effectiveness, and mechanism of action of available COVID-19 vaccines in the U.S., 3. To explain myths concerning the COVID-19 vaccines and why they are false, 4. To explain the vaccine eligibility schedule and where to receive the vaccine once eligible, and 5. To explain why it is important to get vaccinated and to encourage others to get vaccinated. The educational PowerPoint presentation was approximately 30 minutes in length. Participants were able to ask questions during and after the presentation via the Zoom chat feature or unmuting of their microphones to speak. A pre-survey and post-survey were administered before and after the educational session to determine improvements in knowledge and vaccine willingness.

## Pre-and post-surveys

The pre-and post-surveys both consisted of 10 knowledge-based True/False style questions and two opinion-based multiple choice questions concerning willingness to receive or recommend a COVID-19 vaccine. They also included an open-ended question for each of the opinion-based questions as a means to determine the reasons for vaccine hesitancy. The True/False style questions also included an answer choice of "I am not sure" to reduce the number of participants guessing if they knew they did not know the answer. The surveys also included four questions regarding demographics (i.e. gender, race, ethnicity, and educational/employment status within the university). All questions on the pre- and post-surveys were identical. The survey was developed utilizing Qualtrics XM. Participants were provided the links to the pre-and post-survey via the Zoom chat feature at the beginning and end of the educational session, respectively.

All methods and procedures were approved by the institutional Research Review Board.

## Results

131 and 100 participants completed the pre- and post-surveys, respectively. Of those that completed the post-survey, and presumably completed the pre-survey and partook in the educational session in its entirety, 17.0% were freshman, 25.0% sophomores, 28.0% juniors, 23.0% seniors, 6.0% graduate or professional students, and 1.0% faculty or staff. Approximately 23.0% were male and 77.0% female. Five percent were Hispanic, Latino, or Spanish in origin. Eighty three percent were White Caucasian, 12.0% Black African American, 3.0% Asian, and 2.0% American Indian or Alaskan Native.

The number of knowledge-based questions that were answered correctly increased from 55.4% to 86.6% post presentation (See [Table 1](#) for knowledge-based survey questions and responses). There was an 8% increase in those willing to get vaccinated as soon as eligible and a 6.9% decline in those that did not plan

**Table 1:** Survey responses.

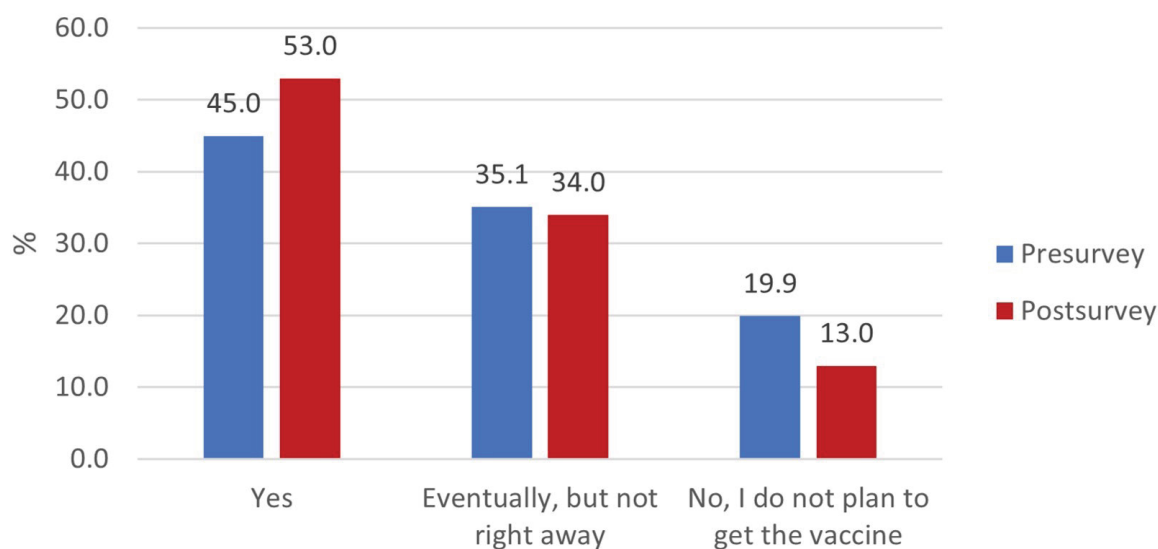
<b>The COVID-19 vaccine can affect women's fertility.</b>	<b>Presurvey (%)</b>	<b>Postsurvey (%)</b>
True	12.2	3.0
False	26.0	93.0
Not sure	61.8	4.0
<b>If a person has already had COVID-19, they do not need to get the vaccine.</b>	<b>Presurvey (%)</b>	<b>Postsurvey (%)</b>
True	7.6	0.0
False	84.7	100.0
Not sure	7.6	0.0
<b>Getting the COVID-19 vaccine may give you COVID-19.</b>	<b>Presurvey (%)</b>	<b>Postsurvey (%)</b>
True	24.4	4.0
False	52.7	94.0
Not sure	22.9	2.0
<b>COVID-19 vaccines alter your DNA.</b>	<b>Presurvey (%)</b>	<b>Postsurvey (%)</b>
True	7.6	2.0
False	66.4	97.0
Not sure	26.0	1.0
<b>Researchers rushed the development of COVID-19 vaccines, so its effectiveness and safety cannot be trusted.</b>	<b>Presurvey (%)</b>	<b>Postsurvey (%)</b>
True	16.9	6.0
False	61.5	93.0
Not sure	21.5	1.0
<b>The COVID-19 vaccine was developed to control general population either through microchip tracking or "nano transducers" in our brains.</b>	<b>Presurvey (%)</b>	<b>Postsurvey (%)</b>
True	3.8	1.0
False	74.1	98.0
Not sure	22.1	1.0
<b>Ages 18-29 account for the highest percentage of COVID-19 cases in the U.S.</b>	<b>Presurvey (%)</b>	<b>Postsurvey (%)</b>
True	45.0	62.6
False	27.5	27.3
Not sure	27.5	10.1
<b>If I get COVID-19 but have no symptoms (asymptomatic), I cannot pass the virus to someone else.</b>	<b>Presurvey (%)</b>	<b>Postsurvey (%)</b>
True	5.3	6.0
False	87.0	93.0
Not sure	7.6	1.0
<b>The COVID-19 virus begins to replicate once it reached the lungs.</b>	<b>Presurvey (%)</b>	<b>Postsurvey (%)</b>
True	25.0	23.0
False	17.6	60.0
Not sure	57.3	17.0
<b>To create immunity, the COVID-19 vaccine introduces live virus into the body.</b>	<b>Presurvey (%)</b>	<b>Postsurvey (%)</b>
True	32.8	22.0
False	38.9	75.0
Not sure	28.2	3.0

on receiving a vaccine (Figure 1). For those that did not plan on getting vaccinated, even after participating in the educational session, the most common reason cited was concern over safety and long-term effects. There was approximately a 16.5% increase in the number of those who agreed or strongly agreed that they would encourage others to get vaccinated, and a decline of 6.5% in those who disagreed or strongly disagreed in doing so after partaking in the educational session (Figure 2). Concern of long-term effects of the vaccine was, again, the most common reason cited for disagreeing. Participants were interactive throughout the presentation and interested in learning more about

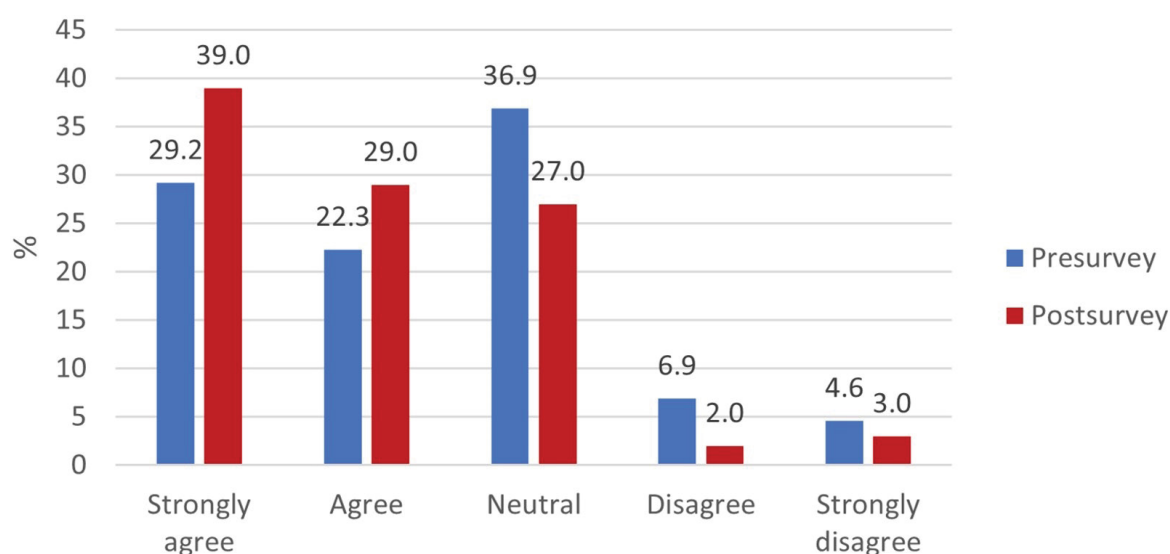
the myths and safety of the specific vaccines presented.

Of the 13 participants who stated in the post-survey that they do not plan on getting the vaccine, 10 (76.92%) of them were female, 12 (92.31%) were White Caucasian and one (7.69%) Black African American, none were of Hispanic, Latino, or Spanish origin, and 3 (23.08%) were freshman, 4 (30.77%) were sophomores, 2 (15.38%) were juniors, and 4 (30.77%) were seniors. None were graduate/professional students or faculty/staff.

Of the 5 participants who disagreed or strongly disagreed on the post-survey to encourage friends and family to get the vaccine, all were White Caucasian



**Figure 1:** Responses to the question, "Will you get vaccinated as soon as you are eligible?" Numbers represent percentage of participants.



**Figure 2:** Responses to the statement, "I will encourage my friends and family members to get vaccinated". Numbers represent percentage of participants.

females and not of Hispanic, Latino, or Spanish origin. Three (60%) of them were freshman and two (40%) of them were sophomores.

## Discussion

The results suggest that the educational session was able to improve knowledge regarding COVID-19 and the vaccines, increased likelihood of vaccination, and increased willingness to encourage others to get vaccinated among a college campus, despite being a virtual venue delivered by student pharmacists.

Results suggest that knowledge improved by approximately 31% from pre- to post-survey. On the pre-survey, all of the questions had a correct response rate below 90%. The majority of questions had a correct response rate below 70%. On the post-survey, only three questions had a correct response rate below 90%. After the educational session, only 62.6% of the participants knew that their age group (18-29) accounted for the highest percentage of COVID-19 cases in the U.S. at the time. This is important because even though this age group typically does not experience severe COVID-19 symptoms and, thus, may not fear getting the illness, when infected they can spread the infection to others who may be more high risk. The 5C model of the drivers of vaccine hesitancy provides five main individual person-level determinants: complacency, confidence, convenience, risk calculation, and collective responsibility [7]. Thus, if the educational session placed more emphasis on the importance of their age group being vaccinated and their impact on the pandemic, then maybe there would have been a greater improvement in those that were willing to get the vaccine as soon as they were eligible to receive it. Only 53% of participants were willing to get vaccinated as soon as eligible. Although, an additional 34% were willing to get vaccinated, just not right away when eligible.

To our knowledge, only one other study has been published on the impact of virtual education outreach on community COVID-19 vaccine hesitancy in the United States. This study reported the impact of education outreach in a military base population [8]. Our results were similar to Li, et al. in that virtual educational sessions were able to reduce COVID-19 vaccine hesitancy [8]. However, different from our study, the educational sessions were provided by physicians, rather than student pharmacists, and the mean age of participants was much older (44.7 years).

There were some weaknesses of our study. First, the participants were mostly female White Caucasian undergraduate students not of Hispanic, Latino, or Spanish origin. Due to the lack of diversity, it is not possible to reliably determine the impact of the educational session on varying demographic groups. Secondly, not all of the participants who completed the

pre-survey, also completed the post-survey making it difficult to conclusively determine the true impact of the educational session on knowledge. It could be possible that those who did not take the post-survey were those who were the least interested and engaged thus learning the least, resulting in inflated post-survey scores. This uncertainty could have been avoided if the pre- and post-surveys were linked to the individual participants. Thirdly, because there was only one experimental group (virtual educational session delivered by student pharmacists), it is not possible to determine if the impact of the educational session would have been different compared to an educational session delivered in-person and/or by fully degreed and licensed healthcare professionals. Future studies, will be needed to confirm that other communities/populations respond positively toward student pharmacist-led educational outreach concerning the COVID-19 vaccines.

## Conclusion

Reaching herd immunity by vaccination is the safest and most effective means to end the COVID-19 pandemic. Unique to this pandemic, the speed of development of the vaccines, political influences, and spread of misinformation on social media have impacted vaccine acceptance like no other. In attempt to improve vaccination rates, a virtual educational session was offered to a college campus community by student pharmacists. Results suggest that the educational session delivered via a synchronous virtual platform by pharmacy students was effective in increasing participant knowledge regarding COVID-19 disease and vaccines, willingness to receive the vaccine, and willingness to encourage family and friends to become vaccinated. Thus, utilization of pharmacy or possibly other health science students may be an untapped resource to educate communities regarding COVID-19 vaccines.

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