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**COVID-19 vaccine status and hesitancy in pharmacy students**

Courtney Doyle-Campbell\textsuperscript{a,\*}, Melissa J. Mattison\textsuperscript{a}, Valerie Amedeo\textsuperscript{b}, Sabrina Gaffney\textsuperscript{b}, Hannah Achadinha\textsuperscript{b}

\textsuperscript{a} Clinical Associate Professor of Pharmacy Practice, Western New England University, 1215 Wilbraham Road, Springfield, MA 01119, United States

\textsuperscript{b} Doctor of Pharmacy Candidate 2022, Western New England University, United States

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**ABSTRACT**

**Introduction:** The purpose of this research is to determine pharmacy students’ immunization status and attitudes towards receiving the COVID-19 vaccine. It will help determine if education is needed to increase the vaccination rate and, if so, what areas to target. The study will also provide insight into vaccine hesitancy among pharmacy students.

**Methods:** In April 2021, a survey was sent to pharmacy students in professional years 1, 2, 3, and 4 at Western New England University in Springfield, Massachusetts. Information gathered included if the student had received and completed the vaccine series, why the student was motivated to receive the vaccine, or why they were hesitant, along with work and experiential rotation information.

**Results:** The response rate to the survey was 63% (133 of 212). Eighty-six percent of the respondents were at least partially vaccinated against COVID-19. Four percent of respondents were not considering receiving the vaccine, 6% were, and another 4% were undecided. Unvaccinated students attributed their hesitancy mostly to being concerned about the vaccine’s long-term effects (85%) followed by not wanting to miss an exam/class (23%). Vaccinated students were more likely to work at a site that administered the COVID-19 vaccine (81.6% vs. 50%, \(P = .003\)).

**Conclusions:** Despite the pandemic, COVID-19 vaccination rates were not higher than voluntary influenza vaccination rates. This study indicates that despite pharmacy students being witness to the risks associated with the pathogen, additional education is needed, and health care providers are not immune to misinformation and hesitancy.

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**Introduction**

Pharmacist-directed vaccination training programs have been shown to increase student perception regarding the importance of immunization.\textsuperscript{1} To date, there have not been studies showing whether this perceived importance translates to the early adoption of novel vaccines. On 11 December 2020, the United States (US) Food & Drug Administration issued an emergency use authorization (EUA) for the Pfizer-BioNTech COVID-19 vaccine in patients 16 years of age and older.\textsuperscript{2} On 15 December 2020, Phase 1 of the vaccine distribution plan began in Massachusetts (MA), which included clinical and non-clinical health care workers performing direct and COVID-19-facing care. Among eligible health care workers were pharmacists and pharmacy interns.\textsuperscript{3}

Pharmacists and pharmacy interns have been on the frontline of the COVID-19 pandemic effort since January 2020, caring for...
Table 1
Immunization training survey.

| Question                                                                 | Options                                      |
|--------------------------------------------------------------------------|----------------------------------------------|
| 1. Which pharmacy class are you in?                                      | Class of 2021, Class of 2022, Class of 2023, Class of 2024 |
| 2. How old are you?                                                     | 18–25 years old, 26–35 years old, 36–45 years old, 46+ years old |
| 3. Please specify your ethnicity.                                        | Non-Hispanic White, Hispanic or Latino, Black or African American, Native American or American Indian, Asian/Pacific Islander, Other |
| 4. Do you believe you are a high-risk individual for COVID-19 based on any health conditions? (Conditions like asthma, obesity, etc.) | Yes, No, Unsure |
| 5. Did you receive the COVID-19 vaccine?                                 | Yes, No, Unsure |
| 6. If yes to question 5, which vaccine did you receive:                 | Pfizer (to question 6), Moderna (to question 6), Johnson & Johnson (skip question 6, go to question 7) |
| 7. If yes to question 5, have you received both doses of the series?     | Yes, No |
| 8. If yes to question 5, which state did you receive the vaccine in?     | MA, CT, NY, Other: ___________________ |
| 9. If yes to question 5, why did you receive the vaccine? (Select all that apply) | I work in a pharmacy/health care setting, I am high-risk, A friend/family member is high-risk, For myself, For others, To help stop the pandemic, To travel |
| 10. If no to question 5, do you plan on getting the COVID-19 vaccine?     | Yes, No, Undecided |
| 11. If you do not plan on getting the COVID-19 vaccine, what is the reason (Select all that apply): | It is not safe, It is not effective, I don’t think I am eligible based on current age requirements, It’s inconvenient to get the vaccine, I don’t want to miss an exam or class due to possible side effects of the vaccine, I’m concerned about long-term side effects, I haven’t thought about it, Religious reasons, Other: ___________________ (fill in the blank) |
| 12. If you did receive the COVID-19 vaccine, where did you receive the vaccine? | At work, Mass vaccination site, Community pharmacy, Non-pharmacy community site (e.g., Senior center), Other: ___________________ |
| 13. Do you currently work at a pharmacy or hospital that administers the COVID-19 vaccine? | Yes, community pharmacy, Yes, hospital pharmacy, No, Other: ___________________ |

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patients and, most recently, providing COVID-19 vaccinations. It is estimated that as of 17 June 2021, pharmacists had given more than 90 million COVID-19 vaccines. In August 2020, the US Department of Health and Human Services increased the immunization scope of pharmacists and pharmacy interns to all patients aged three years and above, essentially expanding the role of pharmacists and pharmacy interns as immunizers in all states.

When this study was conducted, the US was experiencing high COVID-19 infection and mortality rates. In April 2021, 32,228,325 people had been infected with COVID-19, and 577,571 died. In MA, 688973 people had been infected, and 17,610 had died.

Considering the increased scope of pharmacy intern involvement during the COVID-19 pandemic and the personal toll, higher COVID-19 pharmacy intern vaccination rates would be expected as students are aware of the risks of the virus.

Drawing a comparison between influenza vaccine rates and COVID-19 rates may be helpful in determining expected vaccination rates. A Kaiser Family Foundation analysis drew this parallel when they reviewed the influenza vaccination rates within the US population during the 2019–2020 season to reveal potential challenges in achieving COVID-19 immunity. Pharmacist influenza vaccination rates may also parallel with COVID-19 vaccination rates. Regarding influenza vaccination coverage rates, pharmacists during the 2019–2020 flu season ranked just below physicians (98%) and nurses (92%) at 90.6%. In April 2021, a press release by the American Pharmacists Association indicated 92% of pharmacists received the COVID-19 vaccine or planned to as soon as possible. At 91 to 92% for influenza and COVID-19 vaccination coverage, pharmacists are receiving both the COVID-19 and influenza vaccines at near equal rates. An early study conducted prior to the release of the COVID-19 vaccines at the University of Rhode Island showed 92% of pharmacy students were very or somewhat likely to receive the COVID-19 vaccine when it became available. These previous studies demonstrate rates of acceptance of the COVID-19 vaccines are similar to the longstanding influenza vaccine.

The purpose of this research is to determine Western New England University (WNEU) pharmacy students’ immunization status and attitudes regarding receiving the COVID-19 vaccine. The research will help determine if education is needed to increase the vaccination rate and, if so, what areas to target. The study will also provide insight into vaccine hesitancy among pharmacy students.

**Methods**

In April 2021, a 13-question voluntary survey, utilizing skip logic, was developed on Survey Monkey (Momentive, Inc.). The research project was approved by the WNEU Institutional Review Board through an expedited process. The survey collected demographic data and COVID-19 vaccination history. The vaccine history included if the pharmacy student had received and completed the vaccine series, manufacturer information, site location (e.g., mass vaccination site), and if vaccinated, why the student was motivated to receive the vaccine. Students who had not been immunized were asked about future intentions. Those who did not intend to get the vaccine or were undecided were asked to select their reasons for choosing not to be vaccinated. The survey also collected the current work and experiential rotation experience of the students. Students had the opportunity to win one of four $25 gift cards for participating.

The survey was conducted for pharmacy students in professional years 1, 2, and 3 (PY1, PY2, PY3) at WNEU in Springfield, MA during class time. The professional year 4 (PY4) class was sent an email with a link to the survey, as they were on experiential rotations. PY4 students were provided seven days to complete the survey, and one reminder email was sent. The data was analyzed using chi-square test in Microsoft Excel 365 (Microsoft, Corp.).

![Fig. 1. Demographics depicting ethnicity of respondents.](image-url)
Results

The response rate to the survey was 63% (133 of 212); the response rate for each year was 56% for PY1, 58% for PY2, 75% for PY3, and 60% for PY4. The respondent demographics are presented in Fig. 1. These distributions accurately represent the college of pharmacy’s enrollment: White 64.8%, Black or African American 9.9%, Hispanic or Latino/Latina 4.7%, Asian or Native Hawaiian Pacific Islander 11.7%, American Indian/Alaska Native 0%, other/unknown 6.6% (Joshua Spooner, PharmD, Assistant Dean for Student Affairs, Western New England University, email, 8 June 2021). The total students in this study who identify as Black/African American, Hispanic/Latino, and other represent 16% of respondents. This percent correlates with American Association of Colleges of Pharmacy data, which has “underrepresented minorities” accounting for 17% of the enrolled population of pharmacy school’s first-year classes in 2019.11

Eighty-six percent of the respondents were at least partially vaccinated against COVID-19. Four percent of the students responded they were not considering getting the vaccine, 6% were planning on getting the vaccine, and another 4% were undecided (Fig. 2). The most common reasons for deciding to receive the COVID-19 vaccine among pharmacy students included the respondent worked in pharmacy or health care (93%), doing so for others (76%), and to stop the pandemic (80%). Students who had not received the vaccine at the time of taking the survey and were not intending or undecided about becoming vaccinated, attributed their hesitancy mostly to being concerned about long-term effects of the vaccine (85%), followed by not wanting to miss an exam or class to receive the vaccine (23%). Among students who responded that they did not plan on receiving the vaccine, “vaccine is not safe” was equivalent to “do not want to miss class or exam” with 40% for each (Fig. 3); of the respondents that were undecided, none chose this option. One hundred percent of unvaccinated students who did not plan on receiving the vaccine or were undecided considered themselves low-risk for COVID-19, while 80% of the students who were planning to be vaccinated considered themselves low-risk. Vaccinated students responded that 10% considered themselves high-risk, 86% low-risk, and 3% were unsure. There was no difference between vaccinated and unvaccinated respondents that considered themselves high-risk ($P = 0.50$).

Students were most likely to be vaccinated at their work (54%), followed by a community pharmacy (24%). An equal number of vaccinated and unvaccinated students were on an experiential rotation which was a vaccination site, 33.3% of vaccinated students and 33.3% of unvaccinated students. There was a difference between work experience in the groups; 81.6% of the vaccinated students and 50% of the unvaccinated students were working at a site that administered the COVID-19 vaccine at the time of the survey ($P = .003$).

Discussion

The majority of pharmacy students in this study elected to get the COVID-19 vaccine within the first few months of the vaccine’s availability. Those that were undecided or planned not to receive the vaccine had concerns about the long-term effects of the vaccine as their primary concern. The vaccine’s safety or missing class/an exam were additional concerns, but to a lesser degree. If vaccinated and planning to get vaccinated were combined, results of this study support previous research done in the area prior to the release of the COVID-19 vaccine, with a percentage of 90.2% of students reporting very to somewhat likely to receive the COVID-19 vaccine when available.10

There is a clear link between increased vaccination rates and work experience that includes the administration of COVID-19 vaccines. This link may be due to perceived pressure to receive the vaccine, exposure to vaccine advocates, or increased access to the vaccine. The association between vaccine acceptance and experience in a vaccinating pharmacy did not continue with experiential education. This may be due to less time spent at the experiential sites vs. work or lower expectations from some preceptors for interns to participate in direct patient care or immunization clinics. Encouraging preceptors to utilize interns in immunization clinics and students to aid with clinics at work, early and often, may improve vaccination rates among pharmacy students. More research is needed to determine if having students participate in immunization clinics and educational service events, sponsored by the school or college, will improve rates. The association between working in a vaccinating pharmacy and vaccination rates, suggests that ease in

Fig. 2. Student vaccine status and intention.
receiving the vaccine increases the acceptance of the vaccine, and providing the vaccine through colleges or schools would improve percentages and decrease hesitancy.

Other possible areas of targeted education are the history and science behind the messenger RNA and viral vector vaccines to improve student acceptance and decrease safety concerns. It would be worth exploring where these concerns originated and if misinformation or disinformation from social media has influenced the perception of these students. Schools of pharmacy and other health professions might educate students to be hypervigilant about the influences of social media.

If booster doses are needed, schools can provide vaccination clinics on days that will not interfere with exams or classes. Students may delay or skip the vaccine due to concerns about possible side effects of the vaccine and the consequences of missed classes or exams. Holding clinics on Fridays or Saturdays will allow students to avoid this conflict. Offering convenient and timely vaccination clinics would allow the student to receive the vaccine and protect themselves and their community from the coronavirus.

Ultimately, this study provides insight into the first five months following EUA of COVID-19 vaccines. Future studies examining COVID-19 vaccination rates among pharmacists and pharmacy students are essential to determine areas of focus for education and advocacy efforts. This study demonstrates that current vaccine rates for COVID-19 are similar to previous studies for influenza vaccine rates in pharmacists and that more efforts are needed to approach 100% vaccination rates among pharmacists and pharmacy students. Results also mimic the population and that of other health care professionals regarding concerns for safety and possible side effects.12

Despite the similarities with previous studies, vaccine-hesitant students may have been less likely to respond to the survey. This would have skewed the results. In addition, the percentage may vary state-to-state based on vaccine acceptance.

Conclusions

Despite recent experiences with the pandemic, COVID-19 vaccination rates were not higher than influenza vaccination rates which was surprising. One would assume that having classes and rotations canceled due to COVID-19 and witnessing the negative health impacts of the disease on family, friends, and patients would increase willingness to receive the vaccine. This study indicates that despite health care students being witness to the risks associated with the pathogen, additional education is needed, and health care providers are not immune to misinformation and hesitancy.

Disclosure(s)

None.

Author statement

Courtney Doyle-Campbell: conceptualization; methodology; data curation; manuscript; data analysis.
Melissa Mattison: conceptualization; methodology; manuscript; editing.
Valerie Amedeo: research; writing; project administration.
Sabrina Gaffney: conceptualization; software; data analysis; writing.
Hannah Achadinha: research; writing.

Declaration of Competing Interest

None.
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