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## Viewpoint

## COVID-19 vaccination hesitancy in students and trainees of healthcare professions: A global assessment and call for action

Toheeb Mustapha, Jagdish Khubchandani<sup>\*</sup>, Nirbachita Biswas

Department of Public Health Sciences, New Mexico State University, Las Cruces, NM, 88003, USA

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Amidst the global enthusiasm for the COVID-19 vaccine, vaccination hesitancy received wide attention from the media, scientific community, and policymakers. In particular, glaring media reports of vaccine hesitancy among healthcare professionals emerged despite the prioritization of this group for COVID-19 vaccination. A recent review of more than 75,000 healthcare professionals around the world estimated that more than a fifth of the healthcare workers globally was hesitant about COVID-19 vaccinations (Biswas et al., 2021). During the COVID-19 pandemic, a lot of students and trainees in healthcare professions helped serve on the frontlines, worked as volunteers with vaccination campaigns, and took on roles where there could be greater exposure to COVID-19 infection (Bellon and Fares, 2020; Manning et al., 2021; Kanyike et al., 2021). Despite this, not much is known about COVID-19 vaccination preferences and hesitancy in students of healthcare professions around the world.

We conducted a global review to compile empirical evidence on COVID-19 vaccination hesitancy in students and trainees of healthcare professions. The inclusion criteria for the studies in this review were: studies published in the English language, data for studies was collected between April 2020–April 2021, studies quantitatively assessed vaccination hesitancy rates, and included students and trainees in healthcare professions. We searched databases such as CINAHL, Google Scholar, PubMed, EBSCO Host, and pre-print servers with the following

keywords: “vaccine”, “COVID-19”, “hesitancy”, “refusal”, “vaccination”, “coronavirus”, “health”, “college”, “profession”, “student”, “trainee”, “intern”, and “healthcare”. The order of keywords was changed in repeated searches across databases to extract the final pool of relevant studies. Discrepancy on suitability and relevance of the studies to be included were sorted by discussion. COVID-19 vaccination hesitancy rates data were extracted from studies if the study participants were “unlikely”, “refused”, “declined”, or “disagreed” with obtaining COVID-19 vaccination. Pooled prevalence for COVID-19 vaccination hesitancy rates among students and trainees of healthcare professions was estimated from the included studies with 95% confidence intervals using random-effects modeling (Table 1).

In this global assessment including 19 studies across 39 countries, the overall rate of COVID-19 vaccination hesitancy among 19,991 students/trainees of healthcare professions was 18.9% (95% Ci = 14.5–24.2). This rate of COVID-19 vaccination hesitancy (almost one fifth) in students and trainees almost mirrors the rate in practicing healthcare professionals (Biswas et al., 2021). In addition, the major concerns cited by students in healthcare professions are very similar to the concerns cited by practicing healthcare workers and professionals (e.g., concerns about safety, effectiveness, and side effects) (Biswas et al., 2021; Kose et al., 2021; Chew et al., 2021; Grochowska et al., 2021).

<sup>\*</sup> Corresponding author.

E-mail address: [jagdish@nmsu.edu](mailto:jagdish@nmsu.edu) (J. Khubchandani).

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**Table 1**

A Global Assessment of COVID-19 Vaccination Hesitancy Rates and Reasons for Hesitancy in Students and Trainees of Healthcare Professions.

Author/Data Collected	Country	Sample size (N)	Hesitancy Rate	Reasons for Vaccination Hesitancy and Enablers of COVID-19 Vaccine Uptake
Alali et al., July 2021	Kuwait	592*	24.2%	**Reasons: Social stigma about vaccines and lower education level. Enablers: Trust in sources of information (i.e., government sources and healthcare workers).
Pastorino et al., July 2021	Italy	274*	7.3%	**Reasons: Lesser understanding of preventive measures; lower concerns about the pandemic, COVID cases & deaths. Enablers: Male gender, history of flu vaccination, higher perceived susceptibility to COVID-19 infection.
Grüner et al., Aug 2020	Germany	208*	20.2%	**Reason: Low trust in the government, media, and in the German healthcare system. Enablers: Male gender, lower perceived health status, and fear of COVID-19 related health threats.
Kose et al., Sept 2021	Turkey	694*	9.7%	**Reasons: Concerns about vaccine side effects and effectiveness; trust in one's immune system/vaccine not needed. Enablers: Male gender, younger age, history of flu vaccination, higher perceived risk of getting sick.
Manning et al., Sep 2021	USA	1,029*	21.6%	Reasons: Concerns about safety, side effects, rapid development, and mistrust in the vaccine development process. Enablers: Male gender, old age, high perceived risk of COVID-19 infections, willingness to protect family/patients.
Lucia et al., Sep 2020	USA	167	23%	Reasons: Concerns about safety, efficacy, side effects; rapid development/ political influence, mistrust in govt. agencies. Enablers: Belief that vaccines should be mandatory for healthcare workers and can help control the pandemic.
Rosental et al., Sep 2021	Israel	628	17.8%	Reasons: Concerns about safety and side effects, lower perceived risk of COVID-19, fear of needles, lack of time. Enablers: Male gender, past flu vaccination, recommendations from others, greater perceived benefits of vaccines.
Grochowska et al., Nov 2021	Poland	239*	9.6%	**Reasons: Concerns about vaccine safety and effectiveness. Enablers: Male gender, older age, younger age, history of flu vaccination, expert opinion and scientific evidence.
Kelekar et al., Dec 2021	USA	408	35.5%	Reasons: Concerns about effectiveness/side effects, rapid vaccine development, insufficient information about vaccine, mistrust in regulatory agencies, and politicization. Enablers: being minority student, favorable attitude to vaccines.
Szmyd et al., Dec 2021	Poland	687*	4.1%	**Reasons: Concerns about vaccines causing autism, fever and malaise, long-term complications, side effects. **Enablers: General vaccination history, 3 <sup>rd</sup> year students, fear of passing COVID-19 infection to others.
Patelarou et al., Dec 2021	GR, AB, CY, SP, IT, CZ, KO	2,249	22.2%	Reasons: Concerns about vaccine safety, efficacy, and effectiveness. Lower knowledge about COVID-19 & vaccines. Enablers: Male gender, older age, history of flu vaccination, trust in government/experts, fear of COVID-19 infection
Chew et al., Dec 2021	CH, IN, ID, SG, VI, BH	19*	5.3%	**Reasons: Concerns about vaccine allergy and side effects, financial costs, and contracting the virus from the vaccine. Enablers: increased COVID-19 perceived risk, low perceived vaccine harm
Mascarenhas et al., Dec 2021	USA	245	44.5%	Reasons: Concerns about side effects, rapid development of vaccine, mistrust in regulatory agencies, and politicization. Enablers: Trust in public health experts, high perceived risk of infection, and knowing people who were infected/died.
Petravič et al., Dec 2021	Slovenia	624*	33.5%	**Reasons: Concerns about vaccine safety and side effects, mistrust in government, negative attitudes about vaccines. Enablers: Male gender, older age, historical flu vaccination, knowing someone who was infected/died of COVID-19
Saied et al., Jan 2021	Egypt	2,133	19.4%	Reasons: Concerns about vaccine safety, efficacy, side effects, mistrust of vaccination source, lack of information. Enablers: Male gender, past flu vaccination, higher perceived COVID-19 risk for self/others, knowing infected people
Riad et al., Feb 2021	22 countries	6639	13.9%	Reasons: Concerns about side effects, safety, social media impact, lack of information, anti-vaccination belief/attitudes. Enablers: Male gender, advanced stage in school, higher trust in government and pharma industry
Kanyike et al., March 2021	Uganda	600	62.7%	Reasons: Concerns about side effects, safety, effectiveness; misinformation on vaccine; trust in personal immunity. Enablers: Male gender, past flu vaccination, higher perceived risk of COVID infection to self/others, believing vaccines
Jain et al., Mar 2021	India	1068	10.6%	Reasons: Concerns about vaccine safety & efficacy, rapid development, mistrust in government/public health agencies. Enablers: History of hepatitis B vaccine, student of govt medical college, higher perceived risk of COVID-19
Jiang et al., March 2021	China	1488	15.6%	Reasons: Concerns about safety and side effects, rapid vaccine development, lower perceived risk of COVID infection. Enablers: Male gender, higher grade/education, family received vaccine, believe in collective responsibility/vaccines.
Overall	39 countries	19,991	18.9%	Top 3 Reasons: Concerns about safety, side effects, and efficacy. Top 3 Enablers: Male gender, older age, past flu vaccination

\*indicates that the participants were the part of a larger sample \*\* indicates reasons and enablers for the whole sample. A total of 19 studies with 19,991 participants have been included in this Table. Data collection month instead of publication date for the study have been arranged in chronological order in the table. The overall prevalence of vaccine hesitancy was estimated from the included studies with 95% confidence intervals using random-effects modeling.

The high rates of COVID-19 vaccination hesitancy in students of healthcare professions as identified in this review are concerning for multiple reasons. Unvaccinated students and trainees in healthcare professions can pose a risk of COVID-19 infection to themselves, their patients, coworkers, and family members. Healthcare professionals have ethical, legal, and moral obligations to protect their patients and cannot depend on personal protective equipment alone to avoid COVID-19 infections. Furthermore, studies have shown that individuals are more likely to accept COVID-19 vaccination if it is recommended by healthcare providers. If acceptance of COVID-19 vaccines remains lower in healthcare professionals, it remains unclear how they will be able to build confidence in patients and recommend the available vaccines (Kanyike et al., 2021; Grochowska et al., 2021; Biswas et al., 2021).

While not specific to students and trainees, several strategies have been suggested to increase the uptake of COVID-19 vaccines among healthcare professionals (Biswas et al., 2021; Chew et al., 2021; Kose et al., 2021). Multipronged strategies with an emphasis on increasing awareness and education, providing easy access to vaccines and prioritizing students and trainees in healthcare professions, using trusted voices and leaders to encourage vaccination, allowing time and incentives to get vaccinated, and setting up healthcare facility-based protocols or mandates to obtain vaccinations have been suggested as potential options. We believe that it is critical for healthcare facilities and healthcare leaders worldwide to reemphasize COVID-19 vaccination for students, trainees, and interns in the healthcare professions.

#### Declaration of competing interest

We have no conflicts of interests to declare on this paper by any of the co-authors.

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