

COVID-19 VACCINATION ACCEPTABILITY/ HESITANCY STATUS PREDICTORS AMONG MEDICAL TRAINEES

By

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Abstract

Introduction: High COVID-19 vaccination acceptance rates and medical trainees' coverage as future health care providers is essential to be accomplished. Aim of Work: to assess the level of COVID-19 vaccine hesitancy status and to detect the motivators and barriers that may affect it among medical trainees. **Materials and Methods:** A cross-sectional study was conducted among medical trainees in different universities, Egypt. Data was collected via online questionnaire submitted in social media groups during August to November 2021 from 1008 medical trainees representing different governmental and private universities. **Results:** Most of trainees (79.2%) perceived that they may catch the COVID-19 infection during their training, 31.9% had vaccination hesitancy, and only 40 trainees refused the vaccine. Almost half of hesitant trainees were worried regarding the vaccine's infectiveness in transmitting or preventing infection (50.6%) and side effects (66.8%). The most important motivator was that vaccination decreases the severity of infection (88.9%) among acceptance group. The predictors of acceptance/hesitancy status are vaccine is important for face to face contact (OR: 1.60; $p=0.038$), and to reduce severity of COVID-19 infection (OR: 2.86; $p=0.005$), vaccine should be mandatory to travel abroad (OR: 2.3; $p=0.016$), and vaccine should be mandatory administrated for all (OR: 4.10; $p=0.000$). **Conclusion and Recommendations:** More than one third of medical trainees had vaccination hesitancy. Decrease the severity of infection is the most important motivator, the predictors of acceptance/hesitancy status among medical trainees are; vaccine is important for face to face contact, to reduce the severity of COVID-19 infection and vaccine should be mandatory to travel abroad. Health authorities and decision-makers should cooperate with each other and work hard to lessen hesitancy and to promote vaccination awareness that helps to improve COVID-19 vaccines acceptanc.

Introduction

COVID-19 pandemic represents a universal threat for all countries all over the world. Efforts have been made since finding out the SARS-CoV-2 virus and its genome and many vaccines development projects has been established by the scientific community. As for influenza with introduction of the vaccine, the acceptance rate was inconsistently low in many nations; this urges appropriate consideration of the vaccine hesitancy problem (Bhuyan, 2021 and WHO, 2021).

In spite of the vaccinations were available, there was refusing or delay in accepting vaccination which was the concept of vaccine hesitancy. The coverage rate will be affected by vaccine hesitancy which was low and herd immunity as a consequence, so, vaccine hesitancy affects the individuals and, the community whole health status (Ella et al., 2021; Nguyen et al., 2021).

Vaccine hesitancy has many attributes and related to the environment of the individual, unstable by time, situation, and vaccines themselves, like decrease perception of disease risk; hereafter, vaccination looks unnecessary. Confidence indicates reliance in effectiveness, vaccination

safety and proficiency of healthcare systems. Convenience comprises affordability, obtainability, and conveyance of vaccines in a secure setting (Saied et al., 2021).

Many factors alter vaccination judgments and affect whether to reject, postpone, or consent particular or all vaccines. It includes disquiet about the efficacy, safety, origin of the vaccine production. In addition to, the believes of rapid development and production of the vaccines without sufficient investigations, besides tales and not accurate information, all are essential COVID-19 vaccination hesitancy factors (WHO, 2012; Bhuyan, 2021; Ella et al., 2021; Nguyen et al., 2021).

Vaccine hesitancy was considered as a threat to worldwide health by WHO. A recent report on COVID-19 vaccine acceptance proved that about 30% of contributors refuse or hesitate to take a COVID-19 vaccine in spite of its availability. The Middle East was one of the regions with the highest rates of vaccine hesitancy worldwide (WHO, 2021).

Medical trainees could assist in controlling the pandemic in numerous means and be prepared for upcoming waves. USA and England medical

schools prepare their students to support medical staffs (Stokes, 2020), for that, medical students should be vaccinated as vaccination of students and healthcare workers is an important step in preventing acquiring the infection from adjoining contact with high-risk patients (Barello et al., 2020).

Medical trainees are at risk of infection with COVID-19 and transferring the infection to others owing to invulnerability. Reaching high coverage rates for COVID-19 vaccination is mandatory as medical trainees are expected to be infected as they are exposed to COVID-19 patients. Medical trainees's vaccination can be used as role models for the community. They will be upcoming physicians and the influencers for their people (Mohamed-Hussein et al., 2021).

Materials and Methods

Study design. This cross-sectional study was conducted among a group/cohort of Egyptian medical trainees

Place and duration of the study. A period of around 2 months was taken to collect the data from August to October 2021, the medical trainees includes medical students and interns (Chaitoff et al., 2016) were contacted

first through the social media groups in Egypt for example Suez Canal Medical Students Association (SC-MSA) and then they received electronically (goggle form) of the study questionnaire.

Study sample. Sample size was calculated based on the lowest prevalence of COVID-19 vaccine refusal among medical or nursing students which was 6 % from Egypt (Saied et al., 2021; Mohamed-Hussein et al., 2021)

Study methods. An unnamed on-line **structured questionnaire** was set using literature from previous studies on vaccine hesitancy either in general or COVID-19 vaccine hesitancy between health care workers (Qiao et al., 2020). The questionnaire was prepared in English language which could be understood by medical trainees. Experts tested the consistency, objectivity, and language clarity of the questionnaire.

A pilot of 30 students and interns was asked for the questionnaire, then reliability testing was done and Cronbach alpha was 0.69. It collected data about basic demographic details, awareness and sources of information regarding COVID-19 vaccine, hesi-

tancy status and former vaccination experience. This questionnaire was collected online using Google forms.

Consent

All subjects participated in the study gave informed consents after appropriate clarification regarding confidentiality of data and aim of the study.

Ethical Approval

The approval of Medical Research Committee of Faculty of Medicine,

Suez Canal University was obtained and complied with local legislation and the Helsinki Declaration (research code: 4587/6/2021).

Data Management

Upon completion of the data collection, analysis was conducted using SPSS software version 23. Afterwards, multivariate logistic regression analysis was used to test the predictors of vaccine hesitancy with adjustments.

Results

A total of 1008 medical trainees from different medical schools of medicine participated in the online survey. Those who reported refusal of this vaccination (40 trainees) were excluded from final data analysis.

Table 1: Socio-demographic characteristics and acceptability/hesitancy status among medical trainees (No=968)

Characteristics and Acceptability status		Vaccine Acceptance Group (No =646)		Vaccine Hesitant Group (No =322)		p-value
		%	No.	%	No.	
Medical School	Government	604	93.5	284	88.2	0.005*
	Private	42	6.5	38	11.8	
Educational level	Pre-clinical	485	75.1	255	71.2	0.155
	Clinical and internship	161	24.9	67	20.8	
Gender	Male	326	50.5	167	51.9	0.682
	Female	320	49.5	155	48.1	
Sources of information about COVID – 19 vaccination	Medical staff	47	7.3	15	4.7	0.04*
	Social Media	233	36.1	128	39.8	
	Community at large	23	3.6	4	1.2	
	All	343	53.1	175	54.3	
Vaccination profile No =1008	○ 150 Agree and received either 1 or 2 doses (14.9 %)					
	○ 496 Agree and waiting to receive (49.3%)					
	○ 322 Hesitant (<i>still thinking/not intending to receive/not sure</i>) (31.9%)					
	○ 40 Disagree (3.9%)					

*: Statistically significant at p-value less than the 0.05 level (Chi-Square tests)

Table 1 illustrated the sociodemographic characteristics difference between the two studied groups, where there is a statistically significant difference between the two groups regarding sources of information about the vaccination and medical school. Around two-fifths of trainees were from governmental type of medical schools. Regarding the acceptability status among the studied sample almost (14.9%) agree and received the vaccine, 496(49.3%) agree and waiting to receive the vaccine, 40(3.96%) disagree, and 322(31.9%) were hesitant (still thinking/not intending to receive/not sure).

Table 2: Comparison of perception and attitude according to vaccination acceptance/hesitancy status among medical trainees (No =968).

Perception, Knowledge and Attitude No.		Vaccine Acceptance Group (No =646)		Vaccine Hesitant Group (No =322)		p-value
		%	No.	%		
I will participate in the Egyptian COVID-19 vaccine trial	Disagree	116	18.0	64	19.9	0.667
	Agree	333	51.5	157	48.8	
	Not sure	197	30.5	101	31.4	
I will motivate my fellow students to receive available COVID 19 vaccine	Disagree	19	2.9	16	5.0	0.000*
	Agree	573	88.7	240	74.5	
	Not sure	54	8.4	66	20.5	
Vaccine should be mandatory for HCWs	Disagree	66	10.2	49	15.2	0.001*
	Agree	520	80.5	224	69.6	
	Not sure	60	9.3	49	15.2	
Vaccine should be mandatory for travelers	Disagree	76	11.8	66	20.5	0.000*
	Agree	462	71.5	190	59.0	
	Not sure	108	16.7	66	20.5	
I may catch COVID-19 during education and training as a medical trainees	Disagree	26	4.0	18	5.6	0.204
	Agree	541	83.7	255	79.2	
	Not sure	79	12.2	49	15.2	
It is important to have a choice between different vaccines	Disagree	29	4.5	12	3.7	0.429
	Agree	552	85.4	273	84.8	
	Not sure	65	10.1	37	11.5	
Medical trainees are eligible for COVID-19 vaccination	Disagree	3	0.5	7	2.2	0.000*
	Agree	634	98.1	286	88.8	
	Not sure	9	1.4	29	9.0	
I trust information from public authorities and government	Disagree	37	5.7	44	13.7	0.000*
	Agree	525	81.3	213	66.1	
	Not sure	84	13.0	65	20.2	

*: Statistically significant at p-value less than the 0.05 level (Chi-Square tests)

As presented in table 2 most variables compared between vaccine acceptance and hesitant groups showed statistically significant difference except for catching the virus during training at hospital also for agreeing on having the right to choose among different vaccines.

Table 3: Comparison of perception of motivators and barriers according to vaccination acceptance/hesitancy status among medical trainees (No=968).

Motivators and Barriers		Vaccine Acceptance Group (No =646)		Vaccine Hesitant Group (No =322)		p-value
		%	No.	%	No.	
Vaccination is important to stay healthy	Disagree	4	0.6	6	1.9	0.08
	Agree	630	97.5	306	95.0	
	Not Sure	12	1.9	10	3.1	
Vaccination decrease spread of infection	Disagree	18	2.8	12	3.7	0.316
	Agree	561	86.8	268	83.2	
	Not Sure	67	10.4	42	13.0	
Vaccination decrease severity of infection	Disagree	12	1.9	9	2.8	0.001*
	Agree	574	88.9	258	80.1	
	Not Sure	60	9.3	55	17.1	
Vaccination keep back social life and face to face contact	Disagree	69	10.7	57	17.7	0.000*
	Agree	510	78.9	208	64.6	
	Not Sure	67	10.4	57	17.7	
Vaccine is not effective enough	Disagree	159	24.6	59	18.3	0.002*
	Agree	251	38.9	163	50.6	
	Not Sure	236	36.5	100	31.1	
Vaccine has serious adverse effects	Disagree	158	24.5	44	13.7	0.000*
	Agree	339	52.5	215	66.8	
	Not Sure	149	23.1	63	19.6	
Vaccine not tested rigorously	Disagree	217	33.6	83	25.8	0.002*
	Agree	267	41.3	172	53.4	
	Not Sure	162	25.1	67	20.8	

*: Statistically significant at p-value less than the 0.05 level (Chi-Square tests)

As presented in table 3, the most important motivators are perceptions of decreasing spread of infection and severity of infection among the acceptance group ($p < 0.05$). Within the hesitant group; vaccine side effects was the most important barrier 66.8% ($p < 0.05$).

Table 4: Multivariable analysis for the association between acceptance (accept, and hesitant) in the studied sample (No =968).

Predictors	Acceptability status		
	Rate Ratio	95% CI	p-value
Vaccine is important for face to face contact	1.60	1.02-2.37	0.038*
Vaccine should be mandatory administrated for all	4.10	3.3 - 4.33	0.000*
Vaccine is important to reduce severity of COVID-19 infection	2.86	1.21 – 3.85	0.005*
Vaccine should be mandatory to travel abroad	2.3	1.7 - 3.7	0.016*
Intercept	<i>1.2</i>	<i>0.0 - 4.9</i>	<i>0.295</i>

* : Statistically significant p-value less than the 0.05 level, CI = Confidence Interval

Excluded variables: gender, grade, sources of information, keep back social life, reduce spread, help to stay healthy, mandatory for health care workers, have adverse effects, vaccine not tested rigorously, not effective enough

Table 4 showed that the two main predictors of acceptance/hesitancy status among medical trainees are that vaccine reduce severity of infection (OR: 2.86 $p < 0.05$) and vaccination should be mandatory administrated for all (OR: 4.10 $p < 0.05$).

Discussion

Vaccine hesitancy is considered as a barrier to control the recent pandemic with its adverse health implications. Considerate the perceptions, knowledge and attitude toward COVID-19 vaccine and increasing acceptance are needed in development of a suitable policy after the pandemic (Qiao et al., 2020).

In the current study, 49.3% of the trainees accepted the COVID-19 vaccination, 31.9% were hesitant and 3.9% rejected the vaccine, and 14.9% were already vaccinated (Table 1).

The studied trainees showed lower hesitancy and higher acceptance percentages than that was reported in a study achieved in Egypt among healthcare providers which was 32.4% and 13.5% respectively (Mohamed-Hussein et al., 2021). The alteration may be caused by the advanced age of health care workers and chronic diseases or co-morbidities prevalence among them and the recent compulsory vaccination in Egypt.

Tam et al., 2020 results exhibited 15.1%, 60.6%, and 24.3% as hesitant, approved and as rejection groups respectively among South Carolina college students. In contrast, (Lucia et

al., 2020) showed that nearly 25% of their studied medical students in USA were hesitant.

The results of the present study are reinforced by a systematic review of COVID-19 described that the acceptance of COVID-19 vaccine rates in different countries showed great variability with lower acceptance rates in the Middle East (Sallam et al., 2021). This issue poses an important constrain for continuing efforts to encompass the pandemic of COVID-19.

Mainstream of applicants knew their eligibility for the vaccination. Comparable results were indicated by (Barello et al., 2020) where 86.1% of university students' in Italy plan to get the COVID-19 vaccine, on the other hand, 13.9% of them refuse vaccination. In spite of that, higher intention to be vaccinated was detected between medical trainees compared to the general population owing to their greater literacy on health-related matters.

Increasing of vaccine hesitancy is coincident with a correspondingly the increased perception of high risk of COVID-19 infection (Table 2). This result was in agreement with Lucia et al., 2020 who stated that over 20%

of students have self-perception of increased exposure risk to COVID-19 infection. At the same time, it is different from other articles, which reported the perception of risk as a fundamental predictor of the intention of protective health behaviors (Betsch and Wicker, 2012).

Brewer et al., 2016 stated that the vaccination attitude is affected by students' knowledge regarding health issues. Consistent results were indicated by (CDC, 2020).

Most contributors having disquiets regarding vaccine effectiveness, safety, and unwanted health effects (Table 3). Egyptian HCWs reported similar concerns (Mohamed-Hussein et al., 2021). These results may elucidate that even though the trainees recognize the importance of COVID-19 vaccine and settle to make the vaccination compulsory, they still have a substantial hesitancy due to a shortage of information about vaccinations safety.

“Decreasing the severity of infection” is among COVID-19 vaccination motivators (88.9% and 80.1 % among acceptance and hesitancy group respectively) (Table 3), and one of the most important predictors of acceptance/hesitancy status (Table 4),

which in agreement with Brewer et al., 2016. Other studies on HCWs' readiness for vaccination established that the level of anxiety as regards acquiring COVID-19 and infecting their families was non-significantly associated with their probability of being vaccinated (CASS, 2020; Schwartz, 2020; WHO, 2020).

The main vaccination barriers were “not testing the vaccine properly and its possible adverse effects (Table 3), similarly, many other studies indicated that two factors related to the hesitancy of vaccines where disquiets about the vaccine's severe adverse effects and deficiency of reliable data. Also, adverse consequences of COVID-19 vaccines as long-term side effects, safety concerns, and suspicion of vaccines lead to vaccine hesitancy (Lucia et al., 2020). Misinformation concerning the vaccines and deficiency of unreliable vaccination knowledge can lead to worry, leading to overestimating possible adverse health effects (Gautam et al. 2020; Karafillakis et al, 2016; Tam et al., 2020).

The World Health Organization notified that the world is struggling another form of epidemic termed “infodemic” that promptly extents false news, confusing information, and

incorrect scientific statements (Naeem et al., 2020). Health information play an important role in prevention of acquiring the infection and help to accept the vaccines which was learned from previous outbreaks of SARS, H1N1, and Ebola (Siegrist and Zingg, 2014). University students have number of sources of information about COVID-19 vaccines, including health experts, personal networks, and social media (Betsch and Wicker, 2012). Hesitancy is aggravated by mass media, conspiracy theory, and misinformation (Puri et al., 2020)

Making decisions belonged to vaccinations are usually affected by social networks, colleagues, family members, and healthcare specialists. Harapan et al., 2020 asserted that majority of the facts about COVID-19 is spread through online media. This information influences perceptions (Synnott and Kevin, 2020); these sources are not a favored source of knowledge due to the public's misinformation (conspiracy theory). In contrary, Malik et al. 2020 reported that health experts; as a reliable COVID-19 data source of information had more data than other sources, this study were among the USA's general population.

So, to increase the acceptance we should improve information on vaccines efficiency (Rzymyski et al., 2021).

Limitations of the study

Some limitations should be taken into consideration while interpreting the study findings. The current study was a cross-sectional design in which causal inferences cannot be settled due to the lack of temporal relationship, use of convenient sample. For forthcoming studies, other designs can be used (with longitudinal studies and probability sampling). Also, as a result of COVID compulsory vaccination in Egypt including students and interns, this leads to increased numbers of acceptance group relative to hesitant group.

Conclusion and Recommendations

More than one third of medical trainees had vaccination hesitancy. Decrease the severity of infection is the most important motivator, the predictors of acceptance/hesitancy status among medical trainees are; vaccine is important for face to face contact, and to reduce the severity of COVID-19 infection and vaccine should be mandatory to travel abroad.

Health authorities and decision-makers should cooperate with each

other and work hard to lessen hesitancy and promote vaccination awareness that helps to improve COVID-19 vaccines acceptance.

Conflict of Interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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