

Original Article

Vaccine Hesitancy: Prevalence and Strategies to Improve Uptake of Optional Vaccines Among Immunocompromised Patients and Health Care Providers

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Abstract

Objective: This study was carried out for determination of vaccine hesitancy and its logics among health care providers (HCPs) across Punjab and immunocompromised patients.

Methods: A cross-sectional analytical study was carried out and collected data from 169 HCPs across Punjab and 199 immunocompromised patients from healthcare facilities associated with Gujranwala Medical College and Al-Aleem Medical College using consecutive snowball sampling method. A self-administered, valid survey form was used to obtain quantitative data. Vaccine hesitancy was defined as refusal to register or uptake an advised vaccine shot despite availability of vaccination services.

Results: In our study sample (n=368), mean age of participants (n=368) was 35 years, and 41% participants were female. 199 participants (54.1%) were immunocompromised patients while 45.9% were HCPs. In our total study population, 151 (41.0%) were vaccine hesitant, among them 51% were HCPs. Only 129 (35.1%) participants have a positive perception & attitude towards general vaccination. The difference in prevalence of vaccine hesitancy is significant between HCPs and Immunocompromised patients (P <0.001). Analysis on Logistic regression showed male gender, younger age group, negative perception and attitude towards vaccination are significant predictors of vaccine hesitancy. Taken yearly influenza vaccine shot was found a non-significant predictor.

Conclusion: It is concluded that vaccine hesitancy is still high among immunocompromised patients and healthcare providers. Continuous health education and media campaigns need to target young male individuals who are under influence of social media.

Keywords: Vaccine Hesitancy, Vaccine, Immunization, Vaccine confidence, Optional vaccines, immunocompromised patients.

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Introduction

Health care providers (HCPs) are the major confidence builder for any immunization campaign.^{1,5} Their communication and advice build the trust of parents and the common man to uptake compulsory and optional immunization. In the time of COVID 19 and other pandemics, vaccination is proposed to be the leading way for administering the pandemic.^{6,7} The COVID pandemic was novel and novelty in vaccine preparation and dissemination

is opted for rapid development and trials of vaccination. This rapidity, with no prior example, has created doubts in minds of common people and even health care providers.^{3,8,9}

The experts in public health refer to “vaccine hesitancy” as a new pandemic which is a concept seen globally. Many European countries have built large projects and social interventions to control the effects of this pandemic.^{6,7,10,11} Social media revolution and corruption in

pharmaceutical industry has lowered the confidence of common public and health care providers (HCPs). Different conspiracy theories have altered the perception about vaccination. Failure of Polio eradication initiative in certain countries have doubted the mechanism of essential vaccination even.^{8,12,13}

Vaccine Hesitancy is not a new phenomenon, but the recent bombardment of both effective and less effective vaccines has raised doubts about the intentions behind such campaigns. The data for vaccine hesitancy is published and it varies from region to region. The conservative and religious societies take the perspective of vaccine in different ways. The current study is designed to determine the vaccine hesitancy, its determinants and effective strategies to combat it among health care providers and immunocompromised patients.

Methods

The analytical study of cross section was carried out from October to December 2024. The target population comprised of healthcare providers across Punjab and the immunocompromised patients presenting to healthcare facilities in Gujranwala medical college and Al-Aleem medical college Lahore. The inclusion criteria for healthcare providers were all physicians who have been living and providing services for at least one year in the public or private sector. The ethical endorsement for undertaking the learning was taken from the local council of bioethics at Gujranwala medical college, Gujranwala.

Estimated sample size was 385 taking estimated prevalence of vaccine hesitancy about 50% at 95% confidence level and 5% margin of error. The healthcare providers were reached through their mobile numbers to participate. Using snowball sampling technique, 210 healthcare providers were contacted through their mobile numbers for participation in research only 134 consented to participate. Then the link for online survey was shared in different healthcare providers groups in the target region to achieve the target sample size. 210 immunocompromised patients visiting the two tertiary care hospitals were invited to participate in the study. 199 immunocompromised patients completed the survey.

We used a pretested pre-validated questionnaire to collect the responses. This questionnaire contained three components; sociodemographic data, three questions regarding COVID booster or annual influenza vaccine uptake or registration or intention to take vaccine and perceptions and attitudes towards vaccination. A negative response to all of three questions about COVID booster or annual influenza vaccine uptake or registration or intention to take vaccine was labeled as hesitancy. We asked about the uptake of yearly influenza shot for determination of specificity of hesitance towards

COVID 19 vaccination only.

Perceptions along with attitudes towards vaccination and reasons for vaccine hesitancy are based on the tool used by Larson et al.¹⁴⁻¹⁶ It contains 15 statements to respond on a Likert scale of disagree to agree on strong basis. There were five statements for each of these three categories that included positive perception/attitude towards all vaccines, negative attitude towards all vaccines and negative attitude towards COVID 19 vaccine. Correct response was given a score of one while being neutral or incorrect response was given a score of zero. We summed up the score into a cumulative score and categorized the data. A score of more than 11 out of 15 was labeled positive attitude, 6 to 10 was labeled neutral and 5 or lesser was considered negative attitude. The questionnaire was considered for face validity and reliability. The Cronbach alpha value was 0.822 i.e. acceptable. Principle component analysis also revealed three-dimensional construct of the 15 questions.

SPSS version 23.0 (IBM SPSS Statistics for Windows, Armonk, NY: IBM Corp) was used for data analysis. Cronbach alpha value was measured to test for reliability of the data collection tool. Principle component analysis was utilized to determine the construct of questionnaire. An eigen value > one was considered a separate dimension. Frequency shows Descriptive qualitative data and mean $\pm$ standard deviation (SD) or, median and Interquartile range shows percentage quantitative. Chi-square test was applied to measure the difference between categories. Shapirowilk test was applied to the quantitative data to determine the normal distribution. Mean or median difference was determined by independent samples t-test or Mann Whitney U test across two categories. All variables were adjusted by Regression analysis with p value < 0.1 in bivariate analysis. A significant considered p value < 0.05 was estimated.

Results

Table 1 shows that 215(58.4%) of the respondents were males while 153 (41.6%) were females. The number of health care providers among the respondents was 169 (45.9%), while that of the immunocompromised patients was 199 (54.1%). The mean $\pm$ Std. Deviation of the age in years was 35.5 ± 8 . The majority of the respondents, 75% (276), stated that they had not taken their annual influenza vaccine while 25% (92) had taken their vaccination. Those that had registered themselves for the COVID-19 booster dose are 214 (58.2%) whereas those that have not registered are 154 (41.8%). The number of respondents that have taken their COVID vaccine shot are 149 (40.5%) of the total respondents whereas their counterparts that have not gotten the shots are 219 which is 59.5% of the respondents. 171 (41%) of the respondents showed acceptance to being

vaccine hesitant whereas 217 (59%) answered that they were not vaccine hesitant. The perception and attitude towards vaccination among the respondents varied in the following way: 189 (51.4%) of the respondents were neutral towards vaccination, 129 (35.1%) were positive about vaccination and 50 (13.6%) were negative about vaccination. A significant section of the respondents had a neutral attitude about the vaccination, explaining why vaccine hesitancy is not a barring factor.

Table 1: Sociodemographic profile of sampled population (n=368)

Characteristics		n	%
Age in years	Mean $\pm$ Std. Deviation	35.5 $\pm$ 8	
Gender	Male	215	58.4
	Female	153	41.6
Group	Health Care Providers	169	45.9
	Immunocompromised patients	199	54.1
Have you taken your yearly influenza vaccine for this year?	Yes	92	25.0
	No	276	75.0
Have you registered yourself for COVID 19 booster dose?	Yes	214	58.2
	No	154	41.8
Have you taken your COVID 19 vaccine shot?	Yes	149	40.5
	No	219	59.5
Vaccine Hesitancy	Yes	151	41.0
	No	217	59.0
Perception & attitude towards vaccination	Negative	50	13.6
	Neutral	189	51.4
	Positive	129	35.1
Perception & attitude towards vaccination Score	Mean $\pm$ Std. Deviation	9.1 $\pm$ 3.5	

These results indicate the populations' knowledge on vaccines and it is evident that the respondents are well educated on vaccination and can make informed decisions on whether to get a vaccine.

Table 2 depicts a cross tabulation of vaccine hesitancy and the sociodemographic data. The health care providers among the respondents that were vaccine hesitant are 51(30.2%) whereas those that are non-hesitant are 118(69.8%). Those that belong to Immunocompromised patients reported 100(50.3%) vaccine hesitant respondents and 99(49.7%) non hesitant respondents. The number of male vaccine hesitant respondents was 71 (33%) of the total number of respondents whereas that of male non hesitant was 144(67%). On the other hand, female vaccine hesitant respondents were 80(52.3%) of the total population while the female non hesitant respondents were 73(47.7%). 117(42.4%) of the vaccine hesitant respondents had not taken their annual influenza vaccine while 159(57.6%) of the non-hesitant respondent had not taken their annual influenza vaccine. Contrarily, 34 (37.0%) of the vaccine hesitant respondents had taken their annual influenza vaccine and 58(63%) of the non-hesitant respondents had taken their annual vaccine shot. 28 (56%) of the vaccine hesitant respondent had a negative perception and attitude towards vaccination, 106 (56.1%) remained neutral and 17(13.2%) had a positive attitude and perception towards vaccination. 22 (44.0%) of the non-hesitant respondents had a negative perception and attitude towards vaccination, 83 (43.9%) were neutral about the same and 112 (86.8%) had a positive perception and attitude towards vaccination.

The number of health care providers that were male in this study was 110(51.2%) while females were 59 (38.6%). The number of males in the sampled immunocompromised patients was 105(48.8%) while females in the immunocompromised group were 94 (61.4%). 63(38.4%) health care providers had taken their annual influenza vaccine while 106(68.5%) hadn't. Among immuno-

Table 2: Cross tabulation between Vaccine hesitancy and sociodemographic data

Variables		Vaccine Hesitant		Non-Hesitant		P value
		n	%	n	%	
Group	Health Care Providers	51	30.2%	118	69.8%	< 0.001
	Immunocompromised patients	100	50.3%	99	49.7%	
Gender	Male	71	33.0%	144	67.0%	< 0.001
	Female	80	52.3%	73	47.7%	
Have you taken your yearly influenza vaccine for this year?	No	117	42.4%	159	57.6%	0.393
	Yes	34	37.0%	58	63.0%	
Perception & attitude towards vaccination	Negative	28	56.0%	22	44.0%	< 0.001
	Neutral	106	56.1%	83	43.9%	
	Positive	17	13.2%	112	86.8%	

Table 3: Cross tabulation between target population and outcome (n=368)

Variables		Health Care Providers		Immunocompromised patients		P value
		n	%	n	%	
Gender	Male	110	51.2	105	48.8	.02
	Female	59	38.6	94	61.4	
Have you taken your yearly influenza vaccine for this year?	Yes	63	68.5	29	31.5	< 0.001
	No	106	38.4	170	61.6	
Perception & attitude towards vaccination	Positive	74	57.4	55	42.6	.002
	Neutral	80	42.3	109	57.7	
	Negative	15	30.0	35	70.0	

Table 4: Regression analysis predicting the vaccine hesitancy among sampled population (n=368)

	B	S.E.	Wald	Sig.	Exp (B)	95% C.I. for EXP(B)	
						Lower	Upper
Group (HCP*)	-.495	.256	3.753	.053	.609	.369	1.006
Age in years	-.037	.017	4.920	.027	.964	.933	.996
Male	-.646	.240	7.230	.007	.524	.328	.839
Taken yearly influenza Shot	-.268	.288	.872	.350	.765	.435	1.343
Perception**	-.243	.038	40.649	.000	.784	.728	.845
Constant	3.858	.762	25.632	.000	47.359		

*Healthcare provider, ** Perception & attitude towards vaccination Score

compromised patients, 29 (31.5%) of the respondents had taken their annual influenza vaccine while 170 (61.6%) had not taken their annual influenza vaccine. 115(53.7%) health care providers had registered for COVID-19 vaccine while 54(35.1%) had not registered for the vaccine. 99(46.3%) respondents in the immunocompromised group had registered for the COVID 19 vaccine while 100(64.9%) had not registered for the same vaccine. For the health care providers, 81(40.2%) had taken the COVID vaccine shot while 88 (54.4%) had not taken the COVID vaccine shot. 68(45.6%) people in the Immunocompromised patients had taken the vaccine shot while 131(59.8%) had not taken the vaccine shot. Regarding their perception and attitude towards vaccination, 74(57.4%) health care providers were positive, 80(42.3%) were neutral and 15(30%) were negative about the matter. In the Immunocompromised patients, 55(42.6%) had a positive perception and attitude toward vaccine, 109(57.7%) were neutral and 35(70%) had a negative perception and attitude towards vaccination. The regression analysis results, as indicated in table 4 show that the respondents' perception and attitude towards vaccination have a 0.000 score, which implies that it was statistically significant.

Discussion

This study employs various strategies to address vaccine hesitancy among healthcare providers relative to the specific population's needs and their suitability. Jarrett et al. (2015) advocated for information-based training

among healthcare professionals to enhance the latter's understanding of why the exercise is necessary.¹³ Social media or mass media can help achieve social mobilization and reach a more comprehensive demographic. On the other hand, increasing vaccination knowledge and awareness is fundamental to the cause, particularly when this aspect is combined with motivational incentives. Moreover, improving the level of convenience and access to vaccination would be a friendly approach to a probable hostile population. Identifying the targeted specific people, which is the healthcare personnel, articulates these procedures quicker.¹⁶

Healthcare providers could also hesitate, which elevates the nature of the situation at hand. The public depends on these people to facilitate the vaccination process. More importantly, they are significant facilitators of establishing confidence among members of the public to partake in the process. When they fail to acclimate to the process, the public can respond even more aggressively with protests and even mass demonstrations are possible. Vaccine hesitancy is highly apparent when there is high vaccine demand. Consequently, parents fail to vaccinate their infants.⁷ Teenagers opt against it as a light show of control and power, pregnant women might pose related concerns, and the elderly become suspicious of medicines. Such results indicate how the situation can have trickle-down effects and, in these circumstances, become potential health threats to a more significant population (Al-Mohaithef & Padhi, 2020).¹⁷ Advance healthcare providers' likelihood to

participate in this exercise must be curated so that the personnel become a conduit to public desire to take COVID-19 vaccination.

There is probably some level of hesitancy in the public and among the healthcare providers. Given that the public is less educated concerning the issue of vaccines it may be expected that there would be a high hesitancy among the public than among the healthcare providers. Considering the total number of people who were hesitant in taking the shot was less than those who would consider taking the shot. However, the percentage showed that 41% of the population would not take the shot meaning that achieving the herd immunity was almost impossible since a significant number of the population would not get vaccinated.^{1,2,8}

Herd immunity is achieved when a significant number of people are vaccinated and due to their vaccination, the remaining population would not be at high risks of contracting the disease. For instance, when about 80% of the population is vaccinated against a particular condition then they would limit the transmission of the infection amongst themselves and prevent the remaining 5% who have not been vaccinated from getting the condition. According to WHO, the number of individuals who would be vaccinated to achieve herd immunity against the unfurl of polio was at 95% and the remaining 5% would be protected from getting the condition.

In a longitudinal study by Fridman, Gershon and Geezy the researchers argue that there has been a decrease in the pro vaccine attitudes among the general public regarding the need to vaccinate and the Covid 19 intentions. There is also a reduction of the people's intentions in taking the yearly flu vaccines. The same is depicted in this research where a great percentage of the respondents were not only hesitant in taking the Covid vaccine but also hesitant in taking the flu vaccines. Such results depict that there is more going on that is affecting the people's perceptions of the vaccines.¹⁸ Given the high rates of vaccine hesitancy another problem that the hesitancy rates present is that people who have a high likelihood of being vaccinated also have the lowest likelihood of practicing the Covid health behaviors such as practicing caution when in public places to avoid overcrowding or wearing a mask in public places. Limitations include non-probability sampling and mixed population of healthcare providers. The results from the study bring to light the real situations on the ground concerning vaccine hesitancy for the sake of influencing health strategies for better management of the pandemic.

Conclusion

It is concluded that vaccine hesitancy is still high among immunocompromised patients and healthcare providers. Continuous health education and media campaigns need to target young male individuals who are under influence of social media. Vaccine hesitancy always proved to be a problem in the worldwide leading to vaccine refusal. The problem affects everyone since it concerns protection of the public against adverse health conditions.

Ethical Approval: The IRB/EC approved this study via letter no IRB. 91/GMC dated October 29, 2024.

Conflict of Interest: None

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Authors' Contribution

UFD: Conceptualization of the project

MTJ, NRR: Design of the work.

MM, MA, TI: Data acquisition, analysis, or interpretation.

MM, MA, TI, NRR: Draft the work.

UFD, MTJ: Critical review of important intellectual content.

All authors approve the version to be published.

All authors agree to be accountable for all aspects of the work.

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