

Barriers and Beliefs Related to Covid-19 Vaccine in a Rural Area of Peshawar, Pakistan

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Abstract: Background: After the corona virus outbreak, a new challenge has presented itself in the form of vaccine hesitancy, a decision which stems from personal beliefs and perceptions, which may lead to the prevalence of a disease that can otherwise easily dealt with.

Objective: This study aimed to determine the barriers and beliefs related to COVID-19 vaccine in a rural area of Peshawar, Pakistan.

Materials and Methods: An analytical cross-sectional study was conducted from May 2021 to October 2021 on a population from rural areas of Peshawar with a non-probability convenience sampling technique. An interview based self-administered questionnaire was used with questions regarding beliefs and about the COVID-19 vaccine as well as their vaccination status. An SPSS software was used to analyze the data for descriptive as well as inferential statistics.

Results: A total of 526 people from the rural area participated in our study with 73% males (n = 384) and 27% females (n = 142). Only 23.6% got vaccinated voluntarily, 8% agreed that there was enough information available regarding the vaccine to trust, around 17.5% agreed the vaccine does not cause adverse reactions, only 15.6% believed that the vaccine had no unknown side effects, 22.1% trusted the vaccine to be effective in combating the coronavirus while 54.4% believed it to be a conspiracy.

Conclusion: Vaccine hesitancy was quite profound which was caused by the amalgamation of many negative beliefs based on claims that had no sound basis. A great confusion surrounds the COVID-19 vaccine for the people of the rural area who are concerned about various aspects of the vaccine.

Keywords: Covid-19 vaccines, Covid-19, Sars-Cov-2, Public health, Vaccine hesitancy, Rural.

INTRODUCTION

The World Health Organization (WHO) declared COVID-19 a global emergency on 30 January 2020 that was of public health concern [1]. Owing to its highly contagious nature, it has grown to the level of pandemic status, it spreads as a consequence of SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) [2]. COVID-19 is a viral infection that spreads quickly and usually starts with flu-like symptoms [3]. It may be asymptomatic or may take a mild or severe course [4]. COVID-19 is characterized by significant burden of inflammation, high mortality and a high rate of spread [5]. The most reliable method in slowing down the spread and eventually eliminating the COVID-19 pandemic was to develop a vaccine urgently, as deemed by health experts [6]. However, a new challenge has presented itself in the form of Vaccine Hesitancy of the people who refuse to get vaccinated, a decision that stems from personal beliefs and perceptions [7,8]. Vaccine hesitancy is “*delay in acceptance or refusal of vaccination despite availability of vaccination services*” [9]. Therefore, vaccine hesitancy has become a global

concern as people, even in Pakistan, show reluctance in accepting the available COVID-19 vaccines [10]. Vaccine hesitancy has dire consequences on the affected individual and manifests its effects on the whole community in the future [11, 12]. Vaccine hesitancy is a consequence of the amalgamation of multiple circumstantial factors like the type and nature of vaccine, time, setting and surrounding environment. It is brought about by “*complacency, convenience, and confidence*”. Complacency indicates “*the low perception of disease risk; hence, vaccination seems unnecessary*”. Confidence indicates “*trust in vaccination safety, effectiveness, and competence of healthcare systems*”. Convenience indicates “*availability, affordability, and delivery of vaccines in a comfy context*” [13].

According to the National Command and Operational Center of Pakistan, 39,303,110 out of the 226,780,349 people have been vaccinated which amounts to a meagre 17.33% of the population (at the time of writing this study) [14, 15]. An individual’s decision to either accept or refuse vaccination is influenced by social, cultural, and political framework. A great number of controversies regarding the safety and efficacy of the COVID-19 vaccine have been propagating through social media, the inter-

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net as well as local rumors, thus aggravating vaccine hesitancy among the populous. Disinformation can potentially outright cripple the COVID-19 vaccination program [16].

A study conducted in the USA in 2020, revealed that the efficacy of vaccines, safety in contrast to side effects, social circle, insurance coverage, severity of COVID-19 spread and most importantly their doctor's recommendation were factors that mattered to the general public regarding vaccination [17]. Vaccine Hesitancy is manifested another way due to new variants. As new variants emerge, the population begins to doubt the vaccines and their efficacy whether the old vaccines have the capacity to shield them from the newly presented threat [18]. Vaccine hesitancy has become a global health threat according to World Health Organization [19].

Vaccine hesitancy should not be taken lightly as even those related to the health profession, whose whole professional career revolves around advocating for vaccination, are not exempt from vaccine hesitancy as a study conducted on medical students in Egypt showed that the vaccine acceptance rate was a meagre 35% [20]. In parallel with the alarming situation of COVID-19 vaccine hesitancy, vaccination itself has been the topic of controversy in Pakistan from even before COVID-19 emerged as a pandemic [21].

Since, COVID-19 has an infectious nature and spreads quickly it makes vaccination mandatory to stop it. This research was conducted in order to determine the barriers and beliefs that cause vaccine hesitancy in the common folk living in a typical rural area of Peshawar, Pakistan. Although there have been many studies on this subject but no study focused on the rural population specifically.

MATERIALS AND METHODS

An analytical cross-sectional study was conducted from May, 2022 to December, 2022 in a rural area called Sufaid Dheri (Spina Warai) of Peshawar, Pakistan. A non-probability convenience sampling technique was employed. Our study included all the adult population who consented to be part of the study and were present at the time of data collection. A self-administered questionnaire pertaining to their beliefs and views about the COVID-19 vaccine as well as their vaccination status was employed. The questionnaire consisted of 26 questions regarding vaccination status, barriers and beliefs regarding the COVID-19 vaccine. The validity of the self-made questionnaire was determined by sending the questionnaire to 3 experts for face validity of the questionnaire. A Pilot study was also conducted on 50 subjects for further validation. Participants had three options to respond with (Yes/No/Not Sure). To ensure there was no bias, the data collection was done via interviews and the data collectors were trained to let the participants speak their minds. Data was cleaned later on by screening for any missing information and cross-checking while data entry.

STATISTICAL ANALYSIS

Data was analyzed using SPSS version 25. Frequency tables were drawn for questions related to vaccination status, beliefs and barriers. Chi square test was used to find association between questions related to beliefs and age, education and gender of the participants. Participants were grouped based on age into 3 categories: Young Adult (18-30), Middle Aged Adult (31-50), Senior Aged Adults (>50) [22]. Variables with p-value less than 0.05 were considered significant.

RESULTS

A total of 526 people from the rural area participated in our study with 73% males (n = 384) and 27% females (n = 142). The mean age of the population was 35.3 SD ±12.6. Young Adults were 41.4% (n=218), Middle Aged Adults were 48.7% (n=256) and Senior Aged Adults were 9.9% (n=52). Uneducated participants were 21.7% (n=114), those with primary education were 7.6% (n=40), secondary education 34.2% (n=180), Higher secondary education 12.2% (n=64) and graduates were 24.3% (n=128).

Regarding vaccination status of the participants only 39.5% were vaccinated while 60.5% were not, only 23.6% received the vaccines by their own choice while the rest were forced, not sure or unvaccinated (Table 1). Only 8% agreed that there was enough information available regarding the vaccine to trust it while majority of participants, 72.2% were concerned about the vaccine's potential to cause known adverse effects. Only 10.3% were unsure while meagre 17.5% were not worried about the adverse reactions of the vaccine. Majority of participants (68.1%) believed that the vaccine has many unknown side effects in addition to the known ones, only 22.1% trusted the vaccine to be effective in combating the coronavirus, only 27.4% trusted it to be a genuine pandemic (Table 2).

The associations of variables like Age, Education and Age were found to be statistically significant as mentioned in Tables 3, 4 and 5 respectively. Middle-aged adults exhibited higher levels of vaccine hesitancy as 63.28% were unvaccinated (Table 3). Higher education levels were associated with lower rate of vaccine hesitancy, as education level increases, the percentage of vaccine hesitancy decreases (Table 4). Men showed higher levels of vaccine hesitancy, due to adverse effects, belief in conspiracy theories, vaccine infertility, and the vaccine being against religious teachings (Table 5).

Table 1. Vaccination Status of Participants.

Vaccination Status	Yes n (%)	No n (%)	Not Sure n (%)	Unvaccinated n (%)
Are you vaccinated?	208(39.5%)	318(60.5%)	-	-
Did you get all doses?	144(27.4%)	64(12.2%)	-	318(60.5%)
Did you get vaccinated by your own choice?	124(23.6%)	78(14.8%)	6(1.1%)	318(60.5%)
Was it your preferred vaccine?	84(16%)	72(13.7%)	52(9.9%)	318(60.5%)
Have you been infected with COVID-19 before?	134(25.5%)	363(68.8%)	30(5.7%)	-

Table 2. Beliefs and Barriers regarding COVID-19 Vaccination.

Beliefs and Barriers regarding COVID-19 Vaccination	Yes n (%)	No n (%)	Not Sure n (%)
Do you think the vaccine is effective in preventing COVID-19?	124(23.6%)	304(57.8%)	98(18.6%)
Do you think the vaccine has many unknown side effects?	358(68.1%)	82(15.6%)	86(16.3%)
Is anyone of your friends or family advising you against the vaccine?	250(47.5%)	262(49.8%)	14(2.7%)
Do you think that there is less information regarding the vaccine?	432(82.1%)	42(8%)	52(9.9%)
Is the vaccine of your choice available?	100(19%)	168(31.9%)	258(49%)
Do you think that the hospitals are a source of COVID-19 so you don't prefer going there?	322(61.2%)	160(30.4%)	44(8.4%)
Do you perceive the COVID-19 vaccine is necessary for you?	210(39.9%)	260(49.4%)	56(10.6%)
Everyone in the community should get the COVID-19 vaccine?	212(40.3%)	226(43%)	88(16.7%)
Do you believe that the way to overcome the COVID-19 pandemic is mass vaccination?	176(33.5%)	266(50.6%)	84(16%)
Do you think Chinese vaccines used in government hospitals are better than the other ones?	144(27.4%)	84(16%)	298(56.7%)
Are you concerned regarding the adverse effects of the vaccine?	380(72.2%)	92(17.5%)	54(10.3%)
Are you concerned about the ineffectiveness of the vaccine?	334(63.5%)	116(22.1%)	76(14.4%)
Are you against any kind of vaccination in general?	190(36.1%)	310(58.9%)	26(4.9%)
Do you think that COVID-19 produces mild symptoms only?	178(33.8%)	184(35%)	164(31.2%)
Do you think the vaccine is an excuse for the government to put a tracking chip inside you?	136(25.9%)	240(45.6%)	150(28.5%)
Do you think that the corona is a conspiracy?	286(54.4%)	144(27.4%)	96(18.3%)
Do you think the vaccine causes infertility?	190(36.1%)	152(28.9%)	184(35%)
Do you think the vaccine can cause death?	244(46.4%)	152(28.9%)	130(24.7%)
Do you think the COVID-19 vaccine is a lie to get your personal information by the govt.?	188(35.7%)	168(31.9%)	170(32.3%)
Do you think that the COVID-19 vaccine is against the teaching of Islam?	122(23.2%)	198(37.6%)	206(39.2%)

Table 3. Association of Elements of Vaccine Hesitancy with Age.

		AGE GROUP			Total	P-Value
		Young Adult n (%)	Middle Age n (%)	Senior Age n (%)		
Are you vaccinated?	Yes	82(37.61%)	94(36.71%)	32(61.53%)	208(39.54%)	.003
	No	136(62.38%)	162(63.28%)	20(38.46%)	318(60.45%)	
Do you think that the COVID-19 vaccine is against the teaching of Islam?	Yes	34(15.59%)	72(28.12%)	16(30.76%)	122(23.19%)	.000
	No	114(52.29%)	60(23.43%)	24(46.15%)	198(37.64%)	
	Not Sure	70(32.11%)	124(48.43%)	12(23.07%)	206(39.16%)	

Table 4. Association of Vaccine Hesitancy Related Questions with Education.

Education levels		Uneducated n (%)	Primary Education n (%)	Secondary Education n (%)	Higher Secondary Education n (%)	Graduate n (%)	Total n (%)	P Value
Do you think that the COVID-19 vaccine is against the teaching of Islam?	Yes	22(19.29%)	16(40%)	56(31.11%)	10(15.62%)	18(14.06%)	22(23.19%)	.000
	No	34(29.82%)	10(25%)	32(17.77%)	36(56.25%)	86(67.18%)	198(37.64%)	
	Not Sure	58(50.87%)	14(35%)	92(51.11%)	18(28.12%)	24(18.75%)	206(39.16%)	
		114(100%)	40(100%)	180(100%)	64(100%)	128(100%)	526(100%)	
Do you think the COVID-19 vaccine is a lie to get your personal info by the govt?	Yes	36(31.57%)	14(35%)	94(52.22%)	20(31.25%)	24(18.75%)	188(35.74%)	.000
	No	24(21.05%)	14(35%)	32(17.77%)	24(37.5%)	74(57.81%)	168(31.93%)	
	Not Sure	54(47.36%)	12(30%)	54(30%)	20(31.25%)	30(23.43%)	170(32.31%)	
		114(100%)	40(100%)	180(100%)	64(100%)	128(100%)	526(100%)	
Do you think the vaccine can cause death?	Yes	68(59.64%)	14(35%)	112(62.22%)	16(25%)	34(26.56%)	244(46.38%)	.000
	No	28(24.56%)	12(30%)	22(12.22%)	30(46.87%)	60(46.87%)	152(28.89%)	
	Not Sure	18(15.78%)	14(35%)	46(25.55%)	18(28.12%)	34(26.56%)	130(24.71%)	
		114(100%)	40(100%)	180(100%)	64(100%)	128(100%)	526(100%)	
Do you think the vaccine causes infertility?	Yes	38(33.33%)	14(35%)	92(51.11%)	26(40.63%)	20(15.63%)	190(36.12%)	.000
	No	30(26.31%)	8(20%)	26(14.44%)	26(40.63%)	62(48.43%)	152(28.89%)	
	Not Sure	46(40.35%)	18(45%)	62(34.44%)	12(18.75%)	46(35.93%)	184(34.98%)	
		114(100%)	40(100%)	180(100%)	64(100%)	128(100%)	526(100%)	
Do you think the vaccine is an excuse for the govt to put a chip inside you?	Yes	34(29.82%)	16(40%)	46(25.55%)	14(21.87%)	26(20.31%)	136(25.9%)	.000
	No	42(36.84%)	16(40%)	56(31.11%)	34(53.13%)	92(71.87%)	240(45.63%)	
	Not Sure	38(33.33%)	8(20%)	78(43.33%)	16(25%)	10(7.81%)	150(28.51%)	
		114(100%)	40(100%)	180(100%)	64(100%)	128(100%)	526(100%)	

Table 5. Association of Elements of Vaccine Hesitancy with Gender.

		Male n (%)	Female n (%)	Total n (%)	P Value
Are you concerned regarding the adverse effects of the vaccine?	Yes	282(73.43%)	98(69.01%)	380(72.24%)	.000
	No	78(20.31%)	14(9.85%)	92(17.49%)	
	Not Sure	24(6.25%)	30(21.12%)	54(10.26%)	
		384(100%)	142(100%)	526(100%)	
Do you think that the vaccine is just an excuse for the government to put a tracking chip inside you?	Yes	126(32.81%)	10(7.04%)	136(25.85%)	.000
	No	156(40.62%)	84(59.15%)	240(45.62%)	
	Not Sure	102(26.56%)	48(33.80%)	150(28.51%)	
		384(100%)	142(100%)	526(100%)	

		Male n (%)	Female n (%)	Total n (%)	P Value
Do you think that the corona is a conspiracy?	Yes	228(59.37%)	58(40.84%)	286(54.37%)	.001
	No	94(24.47%)	50(35.21%)	144(27.37%)	
	Not Sure	62(16.14%)	34(23.94%)	96(18.25%)	
		384(100%)	142(100%)	526(100%)	
Do you think the vaccine causes infertility?	Yes	172(44.79%)	18(12.67%)	190(36.12%)	.000
	No	122(31.77%)	30(21.12%)	152(28.89%)	
	Not Sure	62(23.43%)	34(66.19%)	96(34.98%)	
		384(100%)	142(100%)	526(100%)	
Do you think that the COVID-19 vaccine is against the teaching of Islam?	Yes	110(28.64)	12(8.45%)	122(23.19%)	.000
	No	134(34.89%)	64(45.07%)	198(37.64%)	
	Not Sure	140(36.45%)	66(46.47%)	206(39.16%)	
		384(100%)	142(100%)	526(100%)	

DISCUSSION

Vaccine hesitancy is a real threat to global efforts in controlling the pandemic of COVID-19 as demonstrated by this study. However, it is not limited only to third-world countries like Pakistan. A study done in Australia reported 82.8% of the participants of the study had doubts regarding vaccine efficacy and safety, while 26.9% perceived the COVID-19 vaccine to be unnecessary, and around 28% perceived it unnecessary in France as well [23]. In our study the results were of great contrast, as only 23.6% of the participants deemed the COVID-19 vaccine as effective, 72.2% were concerned about its adverse effect, 39.9% thought it was necessary and only 35% believed that the coronavirus could cause more than just mild symptoms and took it seriously. A study on vaccine hesitancy showed that out of a list of countries Russian respondents reported having the lowest percentage of positive responses (40.9%) [24], in comparison to this result, our study shows far negative results. In another survey on the COVID-19 vaccine acceptance from 33 different countries, it was found that the lowest COVID-19 vaccine acceptance was found in Kuwait (23.6%), Jordan (28.4%), Italy (53.7%), Russia (54.9%), Poland (56.3%), US (56.9%), and France (58.9%) [25]. In comparison to these values, only 39.9% of the participants from our study considered the COVID-19 vaccine necessary.

A study on the association of vaccine effectiveness with vaccine hesitancy further elaborated that vaccine acceptance of a COVID-19 vaccine greatly depends on its baseline effectiveness. The study reported that, among the 93% of participants who desired to get vaccinated for a vaccine that was proven to be 95% effective, it dropped to 67.0% acceptance for a vaccine with 50% effectiveness. Evidently, it would be a great ordeal to convince the general population to accept a vaccine with relatively low effectiveness [26]. Another sure predictor of vaccine acceptance was reported to be high levels of education in our study. Participants who had graduated or passed higher secondary exams showed results in favor of vaccination and were less likely to believe in conspiracies and rumors. The same results

were reported by a study done in Kuwait, Jordan and some other Arab countries, where education levels had a positive association with vaccine uptake and reported that educated participants were less likely to believe in conspiracies, as they play a great role in the unwillingness of individuals to get vaccinated [27].

In our study, only 37.6% believed that the COVID-19 vaccine was not against the teachings of Islam. These figures are very low despite the fact that all major bodies representing Islamic ideologies declared vaccines to be permitted in Islam. For Muslims, the components of the vaccines are of great concern, as the study showed that the Muslim community in Malaysia was legitimately concerned regarding the halal status of vaccines among several risk factors [28].

In our study, males were more hesitant regarding COVID-19 vaccination compared to females because of concerns about adverse effects, safety, infertility, and micro chipping by the government. A similar reluctance to get COVID-19 vaccines in the male population was reported in a study done in a collection of Arab countries [28]. Both male and female participants of our study were concerned with the COVID-19 vaccine’s effect on the reproductive system. Although studies suggest the vaccine did not affect fertility at all for both females and males [29, 30]. Nearly 36.1% of the participants in our study believed that the vaccine caused infertility while 35% were not sure.

The Coronavirus has been subjected to a great number of conspiracies as well, especially regarding its origin. All these conspiracies can be traced back to sources of misconceptions and superstitions [31]. Misinformation may lead to greater vaccine hesitancy among the population. In our study, only a minuscule 8% of the population believed that there was enough information regarding the vaccine to trust it and only 27.4%, of the participants, believed that the coronavirus was a genuine pandemic and not a hoax, the rest were either certain or had doubts that the vaccine was a means to inject microchips into people. According to YouGov poll, 28% of the Americans believed that vaccines

are being used as a means to implant microchips in people [32].

Vaccination itself through the years has faced a great number of allegations. In our study, only 58.9% of the participants reported that they were not against vaccination, which means close to half of the participants were against it or had doubts. In a study on websites with vaccine critical narratives, the most common findings were statements that claimed that specific adverse reactions were associated with vaccinations, especially of the idiopathic and chronic nature, diseases as the likes of multiple sclerosis, autism or diabetes [33]. Additionally, other common allegations claimed that vaccines contain contaminants such as mercury causing adverse events; statements that the vaccine provides mild and temporary protection; allegations of conspiracies and cover-ups; violation of freedom rights through mandatory vaccination. The consequence of all which will be that the incidences of preventable diseases will be likely to rise [33].

A meager 15.6% of the participants in our study believed the vaccine carried no unknown side effects and a negligible 17.5% were confident regarding not developing any adverse reactions. In a study done on the adverse effects experienced among vaccinated participants [34], 25.4% claimed to have experienced systemic adverse effects, while 66.2% experienced one or more local adverse effects. Fatigue and headaches were the most commonly occurring systemic side effects that the participants faced and reported within 24 hours after COVID-19 vaccine administration. Among local effects, tenderness and local pain around the vaccine administration site were commonly reported. Other reported adverse reactions included skin allergic reactions such as rashes, burning skin and red welts appearing on the face and lips, such side effects were experienced by 1.7% (about 10860) of the participants [34].

In another study done on the adverse reactions of vaccination among residents in the United Arab Emirates, it was reported that the adverse effects subsequent to the first vaccine dose comprised of injection site pain, fatigue and headache. In terms of the second dose pain at the vaccination site, fatigue, lethargy, headache and tenderness were the most common side effects. It was reported that adverse effects were common in females compared with males. As for those who refused vaccination, the most common reason stated was the vaccine's inefficacy [35]. Same was the case with the Oxford–AstraZeneca COVID-19 vaccine, due the blood-clotting disorder among some recipients of the vaccine, there was a wide spread panic in the general public as well as among the manufacturers of the vaccine, leading to misconceptions and vaccine hesitancy [36]. Studies have even reported the development of Immune thrombocytopenia as a response to the COVID-19 vaccination, as inactivated vaccines can trigger immunity against platelets [37]. In our study a meager 28.9% believed that the vaccine was safe and does not pose a threat to an individual's life, a looming fear of premature death always remains however despite measures to prove vaccine safety. According to the CDC, there have been reported deaths due to the COVID-19 vaccine. Despite being very rare, about 0.0022% of the population in the USA that administered

the vaccine suffered fatal consequences [38]. Although this may not be such a significant number but enough to cause fear and panic among the general population.

LIMITATIONS

The results of this study cannot be generalized since convenient sampling was employed. A larger and more representative sample from different rural areas of Peshawar may increase the external validity of the study.

RECOMMENDATIONS

Based on our findings, the authoritative bodies and public health organizations need to develop educational campaigns specific to different education and age levels and address gender-specific factors, especially concerning males. This can be achieved by visiting schools, workplaces and engaging the people via ad campaigns to spread awareness. It would be of utmost importance to engage with religious leaders as well, to ensure the compatibility of vaccination with religious teachings and cultural norms. Engaging people through trusted individuals like celebrities, politicians and professionals who hold influence and respect within the community can help win the trust of the locals and reduce vaccine hesitancy.

CONCLUSION

Vaccine hesitancy was quite profound in our study population which was caused by the amalgamation of many negative beliefs based on claims that had no sound basis. A great confusion surrounds the COVID-19 vaccine for the people of the rural area who are concerned about less information about the vaccine, known and unknown adverse reactions, infertility concerns, fear of conspiracies, fear of death and perceiving the vaccine as not effective and COVID-19 as a mild disease.

AUTHORS' CONTRIBUTION

- **Abdul Adil Khan:** Conception and design of the study, Data analysis and manuscript writing.
- **Syed Imran Gillani:** Drafting of manuscript and Critical revision.
- **Qazi Haris Wadan:** Study design and Interpretation.
- **Syed Ibne Ali:** Data collection and Data entry.

CONFLICT OF INTEREST

Declared none.

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