

RESEARCH PAPER



# Demographic factors associated with acceptance, hesitancy, and refusal of COVID-19 vaccine among residents of Sukkur during lockdown: A cross sectional study from Pakistan

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## ABSTRACT

**Background:** The World Health Organization has identified vaccine hesitancy among one of the top 10 threats to global health. The ongoing COVID-19 pandemic has devastated global health with higher morbidities and mortality rates. Reducing vaccine hesitancy could achieve immunization. However, different sociodemographic conditions can also hamper these efforts in low- and middle-income countries. The objective of the present study was to assess the demographic factors associated with COVID-19 vaccine acceptance, hesitancy, and refusal among the general Pakistani population.

**Methods:** This cross-sectional study was conducted during the months of February–March 2021 during the pandemic. Sample size was 479. Snowball sampling strategy was used for data collection. Study questionnaires were distributed online using e-mail, twitter, Facebook, and WhatsApp.

**Result:** The overall COVID-19 vaccine acceptance was 40.5%, vaccine hesitancy was 29%, and vaccine refusal was 30% among the study participants. Compared to younger, the vaccine hesitancy and refusal was higher in older people age > 30 years ( $\chi^2 = 7.45, p = .02$ ). Compared to males, vaccine refusal was high among females ( $\chi^2 = 7.45, p = .02$ ). Vaccine refusal was higher in people with less educated <12 compared to more education ( $\chi^2 = 28.68, p < .0001$ ).

**Conclusion:** Older people, females, and less education groups are at more risk of COVID-19 infections due to vaccine hesitancy and refusal. We recommend these groups should be focused in COVID-19 vaccine education programs.

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## Introduction

The ongoing COVID-19 pandemic was a result of SARS-CoV2 virus spread, which causes severe acute respiratory syndrome. COVID-19 was first identified in Wuhan, China, in November 2019.<sup>1</sup> Infection spread all over the world through infected travelers. On 11 March 2020, the World Health Organization (WHO) announced it as a global pandemic.<sup>2</sup> In the last 18 months, 152 million cases have been confirmed and more than 3 million people have died due to infection.<sup>3</sup> The countries including America, India, Brazil, Russia, and England are most affected in terms of COVID-19-related morbidity and mortality.<sup>4</sup> Until now, there is no specific treatment available for SARS-CoV2. However, several pharmaceutical companies, including Pfizer & BioNTech, Moderna, Gamaleya Scientific Institute, Novavax, AstraZeneca, Johnson, and Johnson and Sinovac, using new platforms have developed vaccines to prevent the COVID-19 infections among the population. Vaccine development is not an easy task. To launch a vaccine, there is a need to assess the efficacy and safety of the vaccine through clinical trials.<sup>5</sup> However, due to the severity of COVID-19 pandemic and to save humanity, several governments have approved emergency authorization use of vaccines in public to curtail the spread of new infections and reduce hospitalizations.

Despite the invention of vaccines against COVID-19, there is variability in vaccine acceptance among different countries.<sup>6</sup> The vaccine acceptance among the population depends on demographic factors such as age, gender, education, financial status, profession, ethnicity, living area type, and attitude and beliefs about the vaccine-related questions.<sup>7,8</sup> The delay in accepting or refusing to vaccinate oneself is regarded as vaccine hesitancy. Now, COVID-19 vaccines are available in the markets. Three factors including (1) complacency (person perceives that there is low risk of exposure so no need to vaccinate), (2) convenience (Is vaccine available? Is its cost effective and in easy access?), and (3) confidence (Is the vaccine effective and safe?) are important to achieve full immunization.<sup>9</sup> Questions over the safety of the COVID-19 vaccine are in the debate.<sup>5</sup>

South Asian countries including Pakistan, India, Bangladesh, Nepal, Bhutan, Afghanistan, and Maldives are demographically, religiously, and culturally diverse. These countries are facing problems such as income inequalities, rural–urban divide, low literacy rates, and health-related problems.<sup>10</sup> The prevalence of infectious diseases may vary among these countries. Despite facing such problems, countries including Bangladesh, Bhutan, India, Maldives, Nepal, and Sri Lanka were declared as polio-free countries by the WHO.<sup>11</sup> However, polio virus infections are still

prevalent in Pakistan and Afghanistan. Religion-related narratives circulation electronic media also contribute in vaccine hesitancy.<sup>12</sup>

Previously conducted studies on COVID-19 vaccine hesitancy show variability in vaccine acceptance across the countries. COVID-19 vaccine acceptance was 83%, 77%, 75%, and 68% in China, France, America, and Germany, respectively.<sup>13–15</sup> In predominantly Muslim countries, vaccine acceptance is much lower. For example a report by Sallam et al. has shown that vaccine acceptance in Kuwait and Jordan was 23% and 28%.<sup>16</sup> A report from Saudi Arabia indicated that COVID-19 vaccine acceptance was 68%.<sup>17</sup> COVID-19 vaccine hesitancy in Pakistan is understudied in context of demographic factors. We set up this cross-sectional study to assess the demographic factors associated with COVID-19 vaccine acceptance, hesitancy, and refusal among social media users in Pakistan during the COVID-19 lockdown.

## Methods

### Study setting

This cross-sectional study was conducted during the months of February and March 2021 among residents of Sukkur City. Data was collected from 1 March 2021 to 15 March 2021. Sukkur is the third largest city of Pakistani province Sindh. According to latest census, the population of Sukkur district is 1,488,372. Among this figure, 47.82% are females.<sup>18</sup> Among total population, 54.53% people are literate.<sup>18</sup> Eighty percent of the population speaks Sindhi language, and 20% of the population speaks Urdu language. The economy of the city depends on agriculture, cement, and other small industries. The socioeconomic problems of the city include low literacy rate, gender discrimination, income inequality, and barriers to access good quality healthcare.<sup>19</sup> A pretested online questionnaire consisted of questions about demographic factors, and COVID-19 vaccine was distributed through social media platforms including Facebook, Twitter, WhatsApp, Telegram, and WeChat. Questionnaire was made available in Sindhi and Urdu languages. Snowball sampling strategy was used to collect the data. Participants of the study were asked to refer the same questionnaire to their friends for data collection. Participants were asked about their informed consent on the first page of the online questionnaire. The confidentiality and secrecy of the personal data of study participants was assured. Adults with age  $\geq 18$  years and permanent residents of Sukkur District were included in the study. People aged  $< 18$  years, newly migrated citizens, and citizens who were not belonging to District Sukkur were excluded from formal data analysis.

### Sample size

According to a census conducted by the Government of Pakistan in 2017, the population of Sukkur was 1,488,372.<sup>18</sup> By hypothesizing % frequency of outcome factor in the population 50%  $\pm 5$  at confidence interval 95%, 384 samples were enough to carry out this unmatched cross-sectional study. Open EPI software was used to calculate sample size.<sup>20</sup>

## Sampling

### Variable definition

Vaccine hesitancy/refusal is defined as “delay in accepting or refusal of vaccination despite availability of vaccination.”<sup>21</sup> Demographic variables included factors such as age in years, gender, living area, monthly income, education, and marital status.

### Data analysis

The Excel sheet of data collected online was retrieved. Then, a master Excel sheet was generated. Data was entered and filtered as per inclusion criteria. Then, the Excel sheet was transferred to Special Package for Social Sciences Software (SPSS) version 23 for statistical analysis. Descriptive statistics option was used to calculate the frequencies. Chi-square test was used to associate between two factors and outcomes.  $p$  value  $< .05$  was considered as the threshold of significance.

### Ethical approval

The study was approved by the Research Ethical Review Committee of University of Sindh, Jamshoro.

## Results

### Basic demographic characteristics of study participants

The total number of study participants was 479. Among all study participants, 74.3% participants were aged  $\leq 30$  years. Among all participants, 55.1% were females. Marital status-wise distribution showed that 69.3% participants were unmarried. The educational profiling of data showed that 19.8% of the participants were educated till  $\leq 12$  years, 54.4% of the participants were educated till  $\leq 16$  years, and 25.5% of participants were educated till  $> 16$  years. Among all participants, 57% were residents of urban areas. Financial profiling shows that 38% of the study participants belonged to low socioeconomic status, 86.6% of study participants belonged to middle socioeconomic status, and 5% of study participants belonged to upper

**Table 1.** Basic demographic characteristics of study participants.

Factor	Frequency (%)
<i>Age</i>	
$\leq 30$ years	356 (74.3%)
$> 30$ years	123 (25.7%)
<i>Gender</i>	
Female	264 (55.1%)
Male	215 (44.9%)
<i>Marital status</i>	
Single	332 (69.3%)
Married	147 (30.7%)
<i>Education</i>	
$\leq 12$ (secondary)	95 (19.8%)
$\leq 16$ (undergraduate)	262 (54.7%)
$> 16$ (postgraduate)	122 (25.5%)
<i>Living area</i>	
Urban	206 (57%)
Rural	273 (43%)
<i>Financial status</i>	
Low Socioeconomic Status LSES ( $\leq 50,000$ PKR)	38 (7.9%)
Middle Socioeconomic Status MSES ( $\leq 150,000$ PKR)	415 (86.6%)
Upper Socioeconomic Status USES ( $> 150,000$ PKR)	26 (5.4%)

socioeconomic status (Table 1). The overall vaccine acceptance was 40.5%, vaccine hesitancy was 29%, and vaccine refusal was 30% among the study participants (Table 1).

### Demographic factors associated with COVID-19 vaccine acceptance

Compared to older people (aged >30 years), prevalence of vaccine acceptance was higher among younger people (aged <30 years) ( $\chi^2 = 7.45, p = .02$ ). Compared to females, the prevalence of vaccine acceptance was higher among males ( $\chi^2 = 7.45, p = .02$ ). Compared to less educated people (education <12 years), prevalence of vaccine acceptance was higher among more educated people (education >12) ( $\chi^2 = 28.68, p < .0001$ ) (Table 2).

### Demographic factors associated with COVID-19 vaccine hesitancy

Compared to younger people (aged <30 years), prevalence of vaccine hesitancy was higher among older people (aged >30 years) ( $\chi^2 = 7.45, p = .02$ ) (Table 2).

### Demographic factors associated with COVID-19 vaccine refusal

Compared to younger people (aged <30 years), prevalence of vaccine refusal was higher among older people (aged >30 years) ( $\chi^2 = 7.45, p = .02$ ). Compared to males, the prevalence of vaccine refusal was higher among females ( $\chi^2 = 7.45, p = .02$ ). Compared to more educated people (education >12 years), prevalence of vaccine refusal was higher among less educated people (education >12) ( $\chi^2 = 28.68, p < .0001$ ) (Table 2).

## Discussion

Vaccine hesitancy has been identified among one of top 10 threats to global health.<sup>22</sup> The ongoing COVID-19 pandemic has a devastating impact on global health with the

highest rate of morbidity and mortality among populations. COVID-19 vaccine efficacy varies among different platforms and may have some safety issues.<sup>23</sup> Our study showed that overall vaccine acceptance was 40.5%, vaccine hesitancy was 29%, and vaccine refusal was 30% among the study participants. A previously conducted study from Bangladesh has reported 32.5% vaccine hesitancy, which is very close to our result.<sup>24</sup> This study showed that married males living in urban areas with low income and educated  $\leq 16$  years were hesitant to vaccinate against COVID-19, which is also consistent with the report from Bangladesh that showed hesitancy was higher in males aged >60, without job and low-income profile.<sup>24</sup> The vaccine hesitancy and refusal rates vary in different studies.<sup>6</sup> Our results showed that the vaccine refusal was 30% and that was higher in females with age >30 who had low income and living in rural areas. A report from Saudi Arabia indicated that vaccine hesitancy and refusal was 46.6% among the general population,<sup>25</sup> which is 13% less than that vaccine hesitancy and refusal percentage (60%) of this study. The less hesitancy and refusal will lead to better outcomes of vaccination. Health awareness and education play an important role in vaccine acceptance in Pakistan. Yasmin et al, conducted a study on COVID-19 vaccine acceptance and refusal. They used sample of 1698 participants from entire country. They have reported that 498 participants refused to vaccinate themselves against COVID-19. In refusal group, 69% study participants were females and 47% of participants had education <12 years.<sup>26</sup> Our results can also show the same trend. The previously published qualitative study showed the understanding of Pakistani politicians about COVID-19. The study reported that Pakistani politicians and media commentators think that COVID-19 is an effort to target Islamic nations to allow Jews to rule the world and include nanochips in the bodies of people to gain control. Airing of such comments from TV, lack of health education about COVID-19, having low income, and aged are the factors that are associated with the vaccine hesitancy in our report. Vaccine hesitancy and refusal could be

**Table 2.** Association of factors associated with willingness to accept vaccine against COVID19.

Factor	Overall n = 479% 100	COVID19 vaccine acceptance group n = 194 (40.5%)	COVID19 vaccine hesitant group n = 139 (29%)	COVID19 vaccine refusal group n = 146 (30.5%)	Chi-square	p value
<b>Age</b>						
≤30 years	356 (100%)	157 (44.1%)	97 (27.2%)	102 (28.7%)	7.45	.02
>30 years	123 (100%)	37 (30.1%)	42 (34.1%)	44 (35.8%)		
<b>Gender</b>						
Male	215 (100%)	98 (45.6%)	65 (30.2)	52 (24.2%)	7.45	.02
Female	264 (100%)	96 (36.4%)	74 (28.0%)	94 (35.6)		
<b>Marital status</b>						
Married	147 (100%)	54 (36.7%)	50 (34%)	43 (29.3%)	2.67	.2
Unmarried	332 (100%)	140 (42.2%)	89 (26.8%)	103 (31%)		
<b>Education in years</b>						
≤12	95 (100%)	20 (21.1%)	26 (27.4%)	49 (51.6%)	28.68	<.0001
≤16	262 (100%)	116 (44.3%)	78 (29.8%)	68 (26%)		
>16	122 (100%)	58 (47.5%)	35 (28.7%)	29 (23.6%)		
<b>Living area</b>						
Rural	260 (100%)	77 (37.4%)	57 (27.7%)	72 (35%)	3.46	.17
Urban	273 (100%)	117 (42.9%)	82 (30%)	74 (27.1%)		
<b>Financial status</b>						
LSES (≤50,000 PKR)	38 (100%)	8 (21.1%)	15 (39.5%)	15 (39.5%)	6.93	.13
MSES (≤150,000 PKR)	415 (100%)	175 (42.2%)	118 (28.4%)	112 (29.4%)		
USES (>150,000 PKR)	26 (100%)	11 (42.3%)	8 (23.1%)	9 (34.6%)		

a potential barrier to achieve immunization against COVID-19. There is a need to launch an effective COVID-19-related health education program that can propagate the scientific information about the vaccination of COVID-19.

### Limitations

Our study has several limitations. Firstly, it was a cross-sectional study that represented the responses of a community at a given time point. It was conducted before when vaccines were not available in Pakistan. Therefore, the figure of COVID-19 vaccine acceptance and hesitancy may have changed with time. Secondly, the study was conducted using an online self-administered questionnaire. This could lead to potential bias in responses compared with face-to-face interview method of data collection. Potential bias in responses could be due to the snowball sampling strategy that involved referring to known people, usually people who are friends or relatives tend to have a similar level of hesitance (peer effect). We adopted this method because during COVID-19 lockdown it was the only available method to collect the data. Thirdly, the study did not assess the reasons behind the vaccine acceptance and hesitancy. We recommend that these factors may be considered in future studies.

### Conclusion

COVID-19 vaccine hesitancy and refusal were higher in the general population particularly in elderly people, females, and people with education less than 12 years. There is a need to launch an effective vaccine education program on radio, television, print, and social media to increase knowledge about vaccination so that Pakistan can achieve immunization against COVID-19 among these risk groups.

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### Authors' contribution

AAS: ZAL: JV: study design, data analysis, manuscript writing and revisions.

NMB, RBS: GMK: data collection and assembly.

### Consent to publish

All authors have read and approved the manuscript.

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