



PERSONAL BELIEFS AND ATTITUDES OF COVID-19 INFECTED PEOPLE WITH ABOUT THE COVID-19 VACCINATION

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ABSTRACT

Background: The opinions of those who have recently been diagnosed with COVID-19 about vaccination are not well studied. Given the ongoing need to increase uptake of both the initial vaccine series and booster doses, as well as the various ways that such an experience could impact attitudes, it is crucial to investigate this, especially among those who are suffering from mild-to-moderate illness.

Materials and Methods: It was a cross-sectional observational survey methodology conducted at Quaid-e-Azam Medical College, Bahawalpur between September 3 and November 12, 2021. Study participants were invited to take part in an online survey that asked about their level of immunization as well as their attitudes and opinions toward COVID-19 and the COVID-19 vaccines. Regarding a question about whether COVID-19 vaccination is compatible with religious views as well personal views, participants were asked to explain their beliefs and how they correspond to taking/not taking the vaccine.

Results: 3242 (40.2%) of the 8,075 patients with a COVID-19 diagnosis who were invited to participate in the survey and who were older than 18 years old were fully immunized. But of the 149 people who responded to the survey, 95 (or 63.8%) said they had received all the recommended vaccinations. Between the vaccination groups, responses varied considerably. The vaccinated group was unanimous in their agreement that COVID-19 is a serious public health issue, the vaccines are secure and reliable, and they decided to get vaccinated after taking into account the potential benefits to the community. While the unvaccinated group disagreed vehemently with claims regarding vaccine effectiveness and other preventative public health measures, they responded neutrally to the majority of questions addressing vaccine safety and public health issues. In contrast to the unvaccinated group, which was unconvinced, the vaccination group firmly agreed that receiving the vaccine was consistent with their personal and/or religious beliefs. The qualitative analysis of the free text responses revealed that "risk perception/calculation" and "no impact" of religious/personal beliefs on vaccination decisions were frequent themes/subthemes in both groups. However, among the vaccinated, beliefs related to the "greater good" were a strong driver, while statements highlighting "individual choice" were a third frequent theme for the unvaccinated.

Conclusion: According to our findings, unvaccinated adults who have recently been diagnosed with COVID-19 exhibit two of the three factors that contribute to vaccine hesitancy (complacency and lack of faith in the

11463



vaccines). They also demonstrate that attitudes that emphasize the significance of the greater good encourage participation in public health initiatives.

Keywords COVID-19, Vaccine, Religion, Greater good, individual choice

DOI Number: 10.14704/nq.2022.20.10.NQ551110 **NeuroQuantology 2022; 20(10):11463-11480**

INTRODUCTION

Prior to the release of any COVID-19 vaccines, early surveys were conducted, and 65-78% of respondents indicated that they would be at least somewhat likely to accept the COVID-19 vaccine if it became available [1-6]. People living in rural areas, those who don't have health insurance, and those with less education, on the other hand, reported much lower vaccination acceptance rates [1-3, 5-9]. While differences in political inclinations and educational attainment persisted, differences in vaccine acceptance rates between races and ethnicities decreased over time [10]. Only 77.1% adults had finished the primary vaccine series as of August 2022 [13], and 19% of adults continued to say they would unquestionably choose not to get vaccinated [14].

There is little research evidence regarding vaccine attitudes among people who have contracted COVID-19, despite the abundance of stories in the news media about people who express regret for not getting vaccinated after contracting COVID-19 and suffering serious illness or the loss of a loved one [15-18]. According to data from the Household Pulse Survey, vaccination rates were lower and vaccination resistance was higher among those who had previously been diagnosed with COVID-19 or who weren't sure if they had it in the past [19, 20]. These data did not, however, provide insight into the reasons why that was the case, such as differentiating between individuals who believe that their protection from a viral illness will defend them and those who have had a mild case of COVID-19 and are not worried about contracting it again or spreading it to others as a result of that experience. Additionally, it is unknown how those who contract COVID-19 after receiving the vaccine feel about the vaccines; some may, for example, develop a skepticism about the vaccines' efficacy as a result of their own

experiences, while others may view the experience as underscoring the necessity of receiving the vaccine in order to prevent major disease. Examining the attitudes toward vaccinations among those who have experienced breakthrough infections can provide crucial information for addressing the booster uptake lag, which currently stands at 48% of those eligible for the first stimulant [13]. Adults who were surveyed 7 days after receiving a COVID-19 diagnosis provided their opinions on vaccination attitudes in this manuscript. The following six topics are covered in quantitative results using Likert scale surveys: COVID-19 risk, Vaccine resources and availability COVID-19 vaccine safety, public health aspects of COVID-19, influences on vaccination decisions (including religious/personal beliefs), and self belief in COVID-19 protective measures (including vaccine effectiveness). Additional information about the impact of religious and personal beliefs on vaccination decisions is provided by qualitative results.

MATERIALS AND METHODS

Study Design, Sample and Data Collection: This study used cross-sectional observational survey methodology. The study protocol was approved by the Quaid-e-Azam Medical College, Bahawalpur Institutional Review Board, and informed consent was obtained from each participant prior to enrollment. The study's participants received no payment for their participation.

A multiple-measure online questionnaire that took about 30 minutes to complete was used to collect data from respondents. All adult (over 18 years old) ambulatory care patients who tested positive for SarsCoV-2 at a Quaid-e-Azam Medical College, Bahawalpur facility or were identified as having COVID-19 symptoms by a provider at our facilities were invited to take



part from September 3, 2021 to November 12, 2021.

Quantitative variables: A number of sociodemographic factors were gathered, including age, gender, race, ethnicity, income, education, employment, and parental status. A list of physical and mental health conditions was also given to the participants, and they were asked to check the boxes next to any conditions for which they had received a diagnosis, as well as whether it had been recent or previous.

COVID-19 Experience: When asked about their COVID-19 experiences, respondents were also asked if they had ever been hospitalized or put on a ventilator as a result of COVID-19. A second question asked participants if they had received a COVID-19 vaccination and, if so, which vaccine product and when. A question about future vaccinations was posed to participants who gave a negative response (response options included yes, no, and maybe).

Fear of COVID-19 Scale: A 7-item validated scale [25] was used to measure perceived fear of COVID-19. Participants were asked to rate their agreement or disagreement with each item as it related to their fears and worries about the Coronavirus-19 (1 being strongly disagreed and 5 being strongly agreed). Higher scores indicate greater fear of COVID-19. The total score is determined by adding up item responses and ranges from 7 to 35. Chronbach's alpha, a measure of internal consistency, came to 0.89 for our sample.

COVID-19 Stigma: The Stigma Scale for Chronic Illness (SSCI-8) was used to measure stigma related to COVID-19. This 8-item questionnaire was originally developed to gauge perceived stigmatisation among people with chronic illnesses [26]. Participants were instructed to respond to questions "in reference to your COVID-19 screening status" as part of the questionnaire's adaptation for COVID-

19. Items pertaining to perceived stigma situations associated with one's illness were asked about, and responses provided on a 5-point qualitative scale (ranging from 0 = never to 4 = always) indicated how frequently each item occurred. Greater stigmatization is indicated by higher scores, which range from 0 to 32 when all items are added up. The totaled scores are then transformed into standardized t-scores [27]. The sample we used had an internal consistency of 0.89.

Vaccination beliefs: Participants were asked to rate 34 statements that the study team developed through several iterations and that were based on evidence that was at the time available in the literature from larger population surveys about the factors influencing people's vaccination decisions (concerns about safety, effectiveness, and side effects that were raised in the months before and right after vaccine availability [9]) as well as issues that were being discussed locally or in the media. The risks associated with COVID-19, their access to COVID-19 vaccines, the safety of COVID-19 vaccines, public health aspects of COVID-19/vaccination against COVID-19, influences on the decision to take or not take COVID-19 vaccines (including religious/personal beliefs), and confidence in the protection against COVID-19 that vaccination and non-pharmaceutical interventions like masking and social distancing achieve were all covered. On a scale of 0 to 3, from "none of the time" to "all the time," participants were also asked to rate how often they had worn a mask when leaving their house in the previous two weeks.

Qualitative Variables: Following the quantitative question in the survey was an open-ended question that asked participants to rate how much they agreed with the statement "Taking the COVID-19 vaccine is in accordance with my religious/personal beliefs (0-strongly disagree to 4-strongly agree; 5 -prefer not to

11465



answer"). All participants, including those who chose "prefer not to answer," were then given the opportunity to respond in their own words to the following free-response question: "Please describe those beliefs and how they relate to taking/not taking the vaccine."

Analysis

Quantitative analysis: The vaccinated group included any participant who had received at least one dose of any of the COVID-19 vaccines that had been granted approval. t-tests, Mann-Whitney U tests, chi-square tests, and Fisher's tests were used to compare participant demographic and COVID-related characteristics for continuous variables, ordinal variables, and categorical variables. Using Mann-Whitney U tests, the rankings of each group's vaccine attitudes were compared. SAS 9.4 was used to conduct all analyses.

Qualitative analysis: A consensual qualitative research (CQR) approach [32] was used to derive meaning from free text responses about the effect of personal or religious faith for respondents based on if they had been inoculated or not. Three study researchers coded the data under the supervision of a qualitative research trainer. In cases where the coders could not agree, an auditor was also used for review and to provide input (AMW). 'Vaccinated' and 'unvaccinated' groups of data were separated. Prior to coding (n = 4), all empty or non-text responses were eliminated. Coders and trainers met to create preliminary domains based on visual checking of all responses (N = 145). Each response, or case, that represented a single participant was examined for fit into domains and its potential to apply to various coding classifications (e.g., 2, 3, or 4 codes). Each case was reviewed by the coders individually in search of patterns and fits with the initial domains. Following a meeting to discuss the reasoning, all three coders and the trainer came to an agreement on all but seven codes. With an alpha value of 0.885, which is higher than the 0.823 cut point regarded as indicating good agreement [34], inter-rater agreement was calculated using Krippendorff's

alpha reliability coefficient [33]. A consensus was reached on all domains and themes, with the exception of 4 cases, which were then reviewed by an auditor. Responses were then organised into each core idea, and a final review was carried out to verify fit within themes. During their final meeting, the coders were able to agree on everything the auditor had to say.

RESULTS

8,075 distinct patients who tested positively for COVID-19 between September 3, 2021 and November 12, 2021 at a Quaid-e-Azam Medical College, Bahawalpur facility were given the opportunity to participate in the COVID-19 Digital Health Journey, which served as the recruitment channel for participants in this research study [22]. Of those 8,075 patients, 3,242 (40.2%) were fully vaccinated, 711 (8.8%) were partially vaccinated (i.e., had received one dose of a two-dose regimen), and 4,122 (51.1%) were not vaccinated for COVID-19. 151 people signed up for the study between September 3, 2021, and November 12, 2021, and answered the questions about the vaccine. There were two participants removed because they claimed they had not received a COVID-19 diagnosis. The percentage of people in the study who had finished their primary vaccination series was significantly higher (69.1%) than the percentage of patients who met the criteria and were given a COVID-19 diagnosis during this time (40.2%). Table 1 lists the survey items that were subject to incomplete data collection, and any missing information was not used to analyse those items.

Quantitative results

Table 1 summarises demographic characteristics and responses to COVID-19 questions stratified by vaccination status. Age (p 0.001, vaccinated group older), education (p 0.001, vaccinated group completed higher levels of education), income (p = 0.003, vaccinated group earned higher), and COVID-19 experience (vaccinated group less likely to have been hospitalised, p 0.001, and less likely to have experienced stigma related to COVID-19, p

11466



= 0.042) were all significant differences between the vaccinated and unvaccinated groups. The two vaccines with the highest usage rates were Pfizer (52%) and Moderna (49%) with a median interval of 192 days between doses. Seventy percent of those who had not received the vaccine said they would or might do so in the future, while thirty percent said they would not receive the COVID-19 vaccine.

The beliefs about vaccines are compared between the groups in Table 2. With the exception of concern over COVID-19 variants, all beliefs were statistically different between the two groups.

Statements about how vaccines lower the risk of contracting or developing a serious illness from COVID-19 were more strongly agreed upon by the group who had received vaccinations (all $p < 0.001$). Additionally, the group who had received the vaccine demonstrated better access to, knowledge of, and agreement that the vaccines are safe (all $p < 0.01$) and greater knowledge of where to obtain them.

The group who had received the vaccine firmly believed that COVID-19 was a significant public health issue and that considering the advantages to the community should be considered when deciding whether or not to vaccinate (all $p < 0.001$). The unvaccinated group, on the other hand, gave neutral answers to the majority of questions regarding the vaccine's safety and public health aspects, including whether or not they had considered the community when making their vaccination

decision. The unvaccinated group also showed more ambivalence toward the efficacy of vaccinations in preventing COVID-19, their propensity to receive recommended booster doses, and their confidence in preventative public health measures like mask use or social seclusion as a means of preventing individual infection with or community spread of COVID-19. In addition, compared to 68% of the unvaccinated group in the previous two weeks, about 85% of the vaccinated group frequently or always wore a mask around people or in public ($p = 0.009$).

Regarding variables impacting vaccination choices, both groups concurred that they wouldn't make a difference if their employer, school, or state required or offered incentives for a vaccination; however, the vaccinated group had higher levels of agreement. Over half (57%) of the unvaccinated group gave a neutral response, whereas the vaccinated group received more encouragement to get vaccinated from family and friends and medical professionals ($p < 0.001$) and strongly agreed that taking the vaccine was consistent with their religious/personal beliefs.

Qualitative results

Table 3 presents the final coding themes, subthemes, descriptions, frequency distributions, and examples for the open-ended question about how religious/personal beliefs relate to receiving the vaccine or not. Based on vaccination status, responses and percentage counts are grouped. The following were the primary themes for both groups: (1)

Table 1 Characteristics of participants who enrolled in the study after receiving a COVID-19 diagnosis at Quaid-e-Azam Medical College, Bahawalpur Health facility between September 9, 2021 and November 12, 2021

	Total	Unvaccinated	Vaccinated	p-value
Age, mean \pm sd	52.0 \pm 13.9	46.2 \pm 12.9	54.1 \pm 13.8	0.003
Female sex	118 (80.3%)	30 (78.9%)	88 (80.7%)	0.866
BMI (n = 145), mean \pm sd	31.7 \pm 8.3	32.2 \pm 8.5	31.5 \pm 8.2	0.779
Categories				0.984
Normal	31 (21.4%)	7 (18.9%)	24 (22.2%)	
Overweight	35 (24.1%)	9 (24.3%)	26 (24.1%)	
Obese	79 (54.5%)	21 (56.8%)	58 (53.7%)	
Race				0.328



White	119 (81%)	31 (81.6%)	88 (80.7%)	
Black	10 (6.8%)	1 (2.6%)	9 (8.3%)	
Hispanic	8 (5.4%)	4 (10.5%)	4 (3.7%)	
Other/unknown	10 (6.8%)	2 (5.3%)	8 (7.3%)	
Married	99 (67.3%)	23 (60.5%)	76 (69.7%)	0.221
Education				<0.001
Highschool or less	17 (11.6%)	11 (28.9%)	6 (5.5%)	
Some college or Vocational/technical/Associates degree	52 (35.4%)	16 (42.1%)	36 (33%)	
Bachelor's degree	43 (29.3%)	6 (15.8%)	37 (33.9%)	
Advanced degree	35 (23.8%)	5 (13.2%)	30 (27.5%)	
Employed (n = 145)	114 (76.5%)	29 (76.3%)	85 (78%)	0.742
Current working status (n = 143)				0.216
Working at my normal location	51 (35.2%)	11 (29.7%)	40 (37%)	
Working from home	32 (21.8%)	8 (21.6%)	24 (22.2%)	
Not working/Unemployed due to COVID-19	19 (13.1%)	8 (21.6%)	11 (10.2%)	
Not working right now for other reasons	43 (29.7%)	10 (27%)	33 (30.6%)	
Any comorbidity¹	96 (65.3%)	22 (57.9%)	74 (67.9%)	0.238
Current or past smoker	36 (24.5%)	8 (21.1%)	28 (25.7%)	0.690
Any current mental health diagnosis	59 (39.9%)	16 (42.1%)	43 (39.4%)	0.805
Any past mental health diagnosis	50 (27.5%)	12 (31.6%)	38 (34.9%)	0.661
Covid experience				
Hospitalized	11 (7.4%)	9 (22.5%)	2 (1.8%)	< 0.001
On ventilator	1 (0.7%)	1 (2.5%)	0 (0%)	NA
Stigma Scale T-score, mean \pm sd	54.4 \pm 8.6	57.3 \pm 10.6	53.4 \pm 7.5	0.042
COVID Fear, mean \pm sd	16.5 \pm 6.8	16.3 \pm 7.6	16.6 \pm 6.6	0.795
Vaccine received	-			
Pfizer	-	-	57 (52.3%)	-
Moderna	-	-	42 (38.5%)	-
Johnson & Johnson/Janssen	-	-	8 (7.3%)	-
Not specified	-	-	2 (1.8%)	-
If two-dose vaccine, completed	-	-	95 (96%)	-
If one-dose vaccine, time since dose (days), median (IQR)	-	-	191.5 (173.5, 197.5)	-
If two dose vaccine, time since second dose (days), median (IQR)	-	-	192 (163.5, 216.5)	-
Timesincefullyvaccinated(timesincelastdose-14days),median(IQR)	-	-	178 (149.5, 198.0)	-
Intention to be vaccinated in the future				
	Total	Unvaccinated	Vaccinated	
Yes	-	10 (25%)	-	-
Maybe	-	18 (45%)	-	-
No	-	12 (30%)	-	-

BMI = Body Mass Index; sd = standard deviation; IQR = interquartile range



¹Comorbid conditions include chronic lung disease, diabetes mellitus, cardiovascular disease, chronic renal disease, liver disease, immunocompromised condition, neurologic/neurodevelopmental/ intellectual disability, traumatic brain injury, spinal cord injury, cancer, other chronic disease as identified by the participant

The categories are: (1) Personal/Religious Beliefs, (2) Community vs. Self, (3) Medical, and (4) Other. Supplementary Tables 1 and 2 for the unvaccinated and vaccinated groups, respectively, contain a complete list of items under each theme.

A total of 29 cases from the unvaccinated sample were used to assign 47 codes based on themes and subthemes that were noticed. In this group, the subthemes "references religion" (19%; for example, "My body is my temple.") and "risk perception/ calculation" (17%; for example, "I do not think the vaccine is against my beliefs. Indicating that their religious or personal beliefs had "no impact" on their vaccination decision (15%; for example, My being a born-again Muslim has nothing to do with getting vaccinated), "needs more information/research" (13%; for example, I don't believe that they have tested it long enough to prove it works), and "emphasises individual choice" (11%; for example, I don't believe that they have tested it long enough to prove it works). Even though they mentioned religion, many of the responses from the unvaccinated group stated that their religion had no influence on their choice and were double coded as both "religion having no impact" or "referencing religion" and "individual choice" (for example, Our worldwide church has urged all members to get the vaccine and wear a mask). I don't think it's appropriate for the church or the government to mandate or enforce any kind of medical treatment.

Ninety-nine cases from the vaccinated sample were assigned 163 codes. The phrase "greater good," which refers to the improvement of a group larger than the self (such as a family or community, e.g., "I wanted it, to protect my family, and to show them it is okay [to get vaccinated]), was the most frequently used subtheme in this group, with 25% of responses

indicating this influenced their choice. The following top three themes were similar to those of the unvaccinated group but were endorsed in the opposite direction: "references to religion" (15%); for example, "Love of Neighbor"; "Clothe the poor and feed the hungry, support the widow," and "risk perception/calculation" (15%); for example, "COVID-19 is clearly a disease that will be reduced/eradicated only through herd immunity supported by vaccination." Despite the fact that the vaccine carries some risk, for the majority of people, it is less severe than the disease itself. My religious beliefs are inclusive of all medical procedures and treatments). As "belief in science/vaccines" was the second most frequently mentioned subtheme, it is possible that this belief or trust in the scientific method had an impact on people's decisions (9%; for example, "While I am a Muslim, I believe the science and research that has gone into the development and testing of the vaccines. They're both safe and effective.) Similar to the unvaccinated group, many people mentioned their religious beliefs but claimed they had no bearing on their choice (e.g., My religion has nothing to do with this).

The greater good was mentioned in about half of the responses (12/25) that were coded as "risk perception/calculation," indicating that this group also considered other people's perceptions of risk when calculating their own risk (e.g., "We should protect those who cannot protect themselves," "I chose the vaccine so I wouldn't infect my 10-year-old granddaughter, my baby granddaughter, and other children/high risk people"). I, too, am large probability."). Some of the responses with a "religious" theme (9/40; for example, As a Muslim I try to help others) also made a dual reference to the "greater good" theme. In an effort to avoid doing so, Supplementary Tables

11469



3 and 4 for the unvaccinated and vaccinated groups, respectively, show the frequencies of all overlapping codes.

DISCUSSION

Adults who tested positive for COVID during the delta wave surge were included in this mixed-methods study, and the results revealed distinctly different opinions on a variety of beliefs and attitudes regarding the COVID-19 vaccine. The vaccinated group was unanimous in their agreement that COVID-19 is a serious public health issue, the vaccines are safe and

effective, and they decided to get vaccinated after taking the community benefit into account. Most questions about vaccine safety and public health were answered neutrally by the unvaccinated group, while statements about vaccine effectiveness and other preventative public health measures were strongly disagreed with. In contrast to the unvaccinated group, which was unconvinced, the vaccine group firmly agreed that receiving the shot was consistent with their personal and/or religious beliefs.

Table 2 Vaccine attitudes rated on a scale of 0 – strongly disagree to 4 – strongly agree

	Unvaccinated		Vaccinated		
	N	median (Q1, Q3)	N	median (Q1, Q3)	p- value
COVID-19 risk					
Getting vaccinated is the best way to reduce risk for getting COVID-19	38	1.5 (0, 2)	109	4 (3, 4)	< 0.001
Getting vaccinated is the best way to reduce risk for getting severely ill with COVID-19	38	2 (1, 3)	108	4 (4, 4)	< 0.001
Before/without being vaccinated, my risk for catching COVID-19 was/is high	38	2 (1, 2)	109	4 (3, 4)	< 0.001
Before/without being vaccinated, my risk for becoming severely ill if I did catch COVID-19 was/is high	38	2 (0, 2)	109	4 (3, 4)	< 0.001
COVID-19 is a serious disease that can cause death or long-term symptoms even in healthy younger adults	38	3 (2, 4)	109	4 (4, 4)	< 0.001
How worried are you about the COVID-19 variants (0=not at all worried to 4=extremely worried)	39	2 (1, 3)	109	3 (1, 3)	0.073
Resources and Access					
I was/able to take time off work/school or have someone else care for my family for a few days if I experience side effects from a COVID-19 vaccine	39	3 (2, 4)	107	3 (3, 4)	0.005
I knew/know where I can get a COVID-19 vaccine	40	3 (3, 4)	109	4 (4, 4)	< 0.001
I was/will be able to get a vaccination appointment at a convenient time and location	37	3 (2, 3)	109	4 (3, 4)	< 0.001
I knew/know how to get the vaccine without having to pay out-of-pocket	37	3 (2, 4)	109	4 (4, 4)	< 0.001
Safety					
The COVID-19 vaccines authorized/approved by the FDA are safe and effective for general use	37	2 (1, 2)	109	4 (2, 4)	< 0.001
There is not enough evidence that the COVID-	39	3 (1, 4)	10	1 (0, 2)	< 0.001



19 vaccines are safe and effective for people like me			9		
The COVID-19 vaccines having full FDA approval is important for my decision on being vaccinated	36	2.5 (1.5, 3)	10 9	1 (0, 2)	0.002
Women who are pregnant, breastfeeding, or trying to get pregnant should get the vaccine	37	2 (1, 2)	10 6	3 (2, 4)	< 0.001
Getting COVID-19 is worse than the side effects of the COVID-19 vaccines	37	2 (2, 3)	10 9	4 (3, 4)	< 0.001
The risk of severe illness or death from COVID-19 is greater than the risk of harm from the COVID-19 vaccines	37	2 (2, 3)	10 9	4 (3, 4)	< 0.001
Public Health					
COVID-19 vaccines are our best chance for getting back to normal	38	2 (0, 2)	10 9	4 (3, 4)	< 0.001
COVID-19 is a major public health problem	38	3 (2, 4)	10 9	4 (4, 4)	< 0.001
People who had COVID-19 still need to get the vaccine	37	2 (1, 3)	10 9	4 (2.5, 4)	< 0.001
When deciding whether to take a vaccine, I consider both my individual risk and benefits and those of my community	37	2 (2, 3)	10 9	4 (3, 4)	< 0.001
Protecting public health during a pandemic is more important than personal freedom	38	2 (1, 2)	10 9	4 (2, 4)	< 0.001
I have been vaccinated against other preventable diseases	39	3 (3, 4)	10 9	4 (4, 4)	< 0.001
How likely are you to get a COVID-19 vaccine booster shot if recommended by the CDC/FDA? (0 = not at all likely to 4 = extremely likely)	37	1 (0, 2)	10 9	4 (2, 4)	< 0.001
Influences					
My decision on being vaccinated would not be different if my employer/school required it	37	3 (2, 4)	10 8	4 (3, 4)	< 0.001
My decision on being vaccinated would not be different if my employer/school/state offered a bonus or other prize for it	37	3 (2, 4)	10 9	4 (3, 4)	0.004
My friends and family encouraged me to take the COVID-19 vaccine	39	2 (1, 3)	10 9	3 (2, 4)	< 0.001
My healthcare provider encourages vaccination against COVID-19 for everyone eligible for the vaccines	39	3 (2, 3)	10 8	4 (3, 4)	< 0.001
Taking the COVID-19 vaccine is an accordance with my religious/personal beliefs	35	2 (1, 2)	10 8	4 (2, 4)	< 0.001
Confidence in Protective Measures, 0 = not at all confident to 4 = extremely confident					
How confident are you that getting a COVID-19 vaccine will prevent you from getting COVID?	39	0 (0, 2)	10 9	1 (0, 3)	0.011
How confident are you that wearing a mask will prevent you from getting COVID?	39	1 (0, 2)	10 9	2 (1, 3)	0.004

11471



How confident are you that social distancing will prevent you from getting COVID?	39	2 (1, 3)	10 9	3 (1, 3)	0.011
How confident are you that getting a COVID-19 vaccine will prevent others from getting COVID?	38	1 (0, 2)	10 9	2 (1, 3)	< 0.001
How confident are you that wearing a mask will prevent others from getting COVID?	39	1 (0, 2)	10 9	2 (1, 3)	0.004
How confident are you that social distancing will prevent others from getting COVID?	39	2 (1, 3)	10 9	3 (1, 3)	< 0.001
In the past two weeks, how often do you wear a mask around others/in public?	40		10 9		0.009
None of the time		4 (10%)		2 (1.8%)	
Some of the Time		9 (22.5%)		15 (13.8%)	
Most of the time		10 (25%)		22 (20.2%)	
All of the time		17 (42.5%)		70 (64.2%)	

According to the data supporting the effectiveness of vaccines in preventing disease and associated public health messaging, the vaccinated group in our study sample had a lower hospitalisation rate than the unvaccinated group. This finding is consistent with the evidence [35] and may have contributed to the vaccinated participants' beliefs of a lower risk of developing a serious illness, higher levels of vaccine safety agreement, and the belief that FDA approval was not required for them to receive the vaccine. Similar findings from the UK found that one of the key differences between vaccine-hesitant people and vaccine-accepting people was a lower level of altruism in the former [36]. We also found that the vaccinated recognise that COVID-19 is a serious public health issue and that their decision to vaccinate would benefit the community.

Our findings about lower income and education levels in the COVID-19 unvaccinated patients are in line with known reluctances in these groups [12] and suggest the need for targeted messaging campaigns. The unvaccinated group, despite having COVID-19 infection themselves, expressed the least agreement that vaccines are effective in preventing the spread of the disease and the least confidence in public health measures like mask use or social seclusion [37].

These results are consistent with those from the UK and Ireland. Despite the fact that the majority of unvaccinated respondents said they would get a vaccine in the future, the 30% who said they would not are significantly more than the 19% of US adults who overall continue to say they will not get vaccinated against COVID-19 [14].

The qualitative responses revealed a number of themes that shed light on how religious and personal beliefs influence vaccination decisions. In this sample of unvaccinated adults from Texas' largest not-for-profit health system, we found mixed reporting of religious views influencing decisions, with the vaccinated group more strongly agreeing that their religious/personal beliefs were in accordance with taking the COVID-19 vaccine. The unvaccinated group was more likely to report that their religious beliefs had no influence on their vaccination decision or, where it did, supporting the decision not to vaccinate as aligned with individual choice. In addition, many of those who had received vaccinations mentioned their religious beliefs in conjunction with the idea of the "greater good." According to earlier research with US samples, people who have lower educational achievement are more likely to hold beliefs in an engaged God, which is linked to greater mistrust of the COVID-19

11472



vaccine [38]. It has been reported that leaders and adherents of numerous world religions, including Judaism, Protestant Muslimity, and Catholicism, refuse to receive additional vaccinations because they think it interferes with God's will or because they have faith in divine protection and healing [39, 40]. More specific religious objections have also been

noted, including those from Muslims regarding the use of pork or non-halal ingredients [41–43], Catholics regarding the use of cell lines derived from aborted fetuses [44], and Muslims regarding Ramadan fasting (and the possibility that unfavorable vaccine reactions could cause one to break the fast) [45].

Table 3 Qualitative themes and subthemes for the Unvaccinated Sample (29 total responses; 47 codes applied) and Vaccinated Sample (99 total responses; 162 codes applied)

Vaccinated				Unvaccinated	
Theme	Subtheme and Description	n (%)	Examples	n (%)	Examples
Religious/Personal Beliefs					
References	Religion: Mentions a specific religion (e.g. Muslim), quotes scripture, or mentions religious beliefs generally	25 (15%)	<i>I am Lutheran, so there were no prohibitions or encouragements. It is a personal decision Love of Neighbor; Clothe the poor and feed the hungry, support the widow</i>	9 (19%)	<i>I am Muslim and it has no effect on my vaccination status My body is my temple.</i>
References	God: References God specifically	7 (4%)	<i>I believe God provides scientists with the ability to develop vaccines</i>	2 (4%)	<i>mRNA will effect the human genome. I'm create in the image of God.</i>
			<i>I was not worried about taking the vaccine. My faith is in God.</i>		

11473



No Impact: References religious beliefs in the context of not impacting the decision to get vaccinated or not get vaccinated.		22 (13%)	<i>My religion didn't have anything to do with me getting the vaccine. My faith is open to all medical procedures and treatments</i>	7 (15%)	<i>My being a born again Muslim has nothing to do with getting vaccinated. The decision is not based on religion</i>
	Not Religious	3 (2%)		0 (0%)	
Community versus Self					
Greater Good: References betterment of a group larger than the self (e.g. family, another person, community)		40 (25%)		0 (0%)	
			<i>I wanted it, to protect my family and to show them it is okay to get vaccinated</i>		
			<i>Muslim values call for loving your neighbor as yourself.</i>		
	<u>Emphasizes Individual Choice:</u> Emphasizes the importance of individual decision-making	8 (5%)	<i>I believe it is a personal decision and it does not go against my religion or beliefs.</i>	5 (11%)	<i>It is my choice as well as it does with my body</i>
			<i>I think get the Covid vaccine is a personal choice you make. You should consult your doctor and decide for yourself. Don't let the media or government dictate whether you get it or not.</i>		<i>It should be an individual's decision to get it or not</i>
Medical					

11474



Risk Perception/ Calculation: Decision is based on perceived individual risk to COVID-19 and generally weighing the risk against other factors (e.g. vaccine effectiveness)	25 (15%)	<i>I didn't want to get sick. COVID-19 is clearly a disease that will be reduced/ eradicated only through herd immunity supported by vaccination. While there is a risk in the vaccine, for most people, this is less than the disease it self.</i>	8 (17%)	<i>Worried because of my underlying health conditions. I don't think the vaccine is against my beliefs. I just don't see that they work when vaccinated people are getting just as sick as unvaccinated people, in my opinion</i>
Doctor's Advice:	4 (2%)		0 (0%)	
References decision is impacted by doctor's (or other healthcare workers) advice		<i>All should take unless advised not to by doctor or the religion I understand science and value using it. I trust our health care professionals. I deeply care about other people.</i>		

Table 3 (continued)

	Vaccinated	Unvaccinated
Need More Information/Research: Expresses uncertainty about	1 (1%) <i>I don't trust it. Too much information and nothing is concrete. Only got the vaccine for my job.</i>	6 (13%) <i>I don't believe that they have tested it long enough to prove it works</i>



utvaccinated due to lack of adequate research or information.		Not sure what to believe.
References Side Effects: Mentions specific side effects associated with getting the vaccine.	1 (1%) <i>I believe many vaccines work to keep people healthy but I am worried about side effects such as blood clots with the COVID vaccine</i>	2 (4%) <i>I once got the flu shot and that year I ended up with the worst pneumonia I've ever had in my life right after. So this shot and its side effects worried me. I made it nearly the whole pandemic without getting sick so I felt safe previous blood clotting experience.</i>
Miscellaneous		
Demonstrates Misinformation: Statement includes objectively false information about the vaccine	2 (1%) <i>this really isn't a vaccine, it is a special flu shot. if it was a vaccine, like smallpox, I would not have gotten COVID after receiving the shots</i> <i>I believe that although the vaccination makes changes to our molecules it doesn't significantly make changes that will harm our reproductive systems. For future generations.</i>	3 (6%) <i>The so called vaccines are killing people</i> <i>mRNA will effect the human genome. I'm created in the image of God.</i>
Belief in Science/Vaccines: Decision is impacted by a belief or trust in scientific process or belief that vaccines are generally effective technology against disease (e.g. herd immunity)	15 (9%) <i>While I am a Muslim, I believe the science and research that has gone into the development and testing of the vaccines. They are safe and effective.</i> <i>I firmly believe that vaccines are a solid way to limit and potentially eradicate diseases. Anyone who disagrees is uneducated or misinformed and must be informed.</i>	1 (2%) <i>It is my choice as what I do with my body. As with all medications you should only take fully approved medicines.</i>
References Mandate: References a vaccine mandate or being forced	4 (2%) <i>I do not trust it. Too much information and nothing is concrete. Only got the vaccine for my job.</i>	2 (4%) <i>Being forced to take a vaccine is against the constitution.</i>

11476



to get the vaccine from a larger system	<i>I think get the Covid vaccine is a personal choice you make. You should consult your doctor and decide for yourself. Don't let the media or government dictate whether you get it or not</i>	Our worldwide church has urged all members to get the vaccine and to wear mask. I do not believe it is a right of the church or government to enforce or mandate forms of medical care. It should be a personal choice made between a person and God.
Uncoded: Did not receive a code due to ambiguity or lack of content.	5 (3%) <i>I think people are gonna do what they want to do.</i> <i>I am vaccinated</i>	2 (4%) im not taking None
<p>Note. Percentage is calculated by dividing the count of that subtheme by the total number of codes (n=47 unvaccinated; 162 vaccinated) since some responses (n=14 unvaccinated; 53 vaccinated) received multiple codes. 29 unvaccinated and 99 vaccinated total responses included all text responses (e.g. blanks or symbols removed; n=2 unvaccinated and 2 vaccinated). Additionally, "NA" or "not applicable" responses were also excluded from coding (n=9 unvaccinated; 10 vaccinated)</p>		

Even beyond question's focus on religious views, other religious views expressed by the respondents who had not received vaccinations suggested additional themes and subthemes. These mirrored themes identified in more recent analyses of COVID-19 vaccine hesitancy, including beliefs about the vaccines' lack of efficacy and safety and worries about their rapid development [47]. Themes of personal liberty and freedom, which have sparked protests and unrest worldwide in relation to vaccination requirements for employment and travel, were also prevalent among the sample of unvaccinated respondents. These concerns are similar to those previously voiced against the need for immunisation against other diseases, such as those that were expressed in response to the smallpox vaccine [48, 49].

The immunised participants in the current sample appeared to be extremely driven by a sense of personal responsibility to defend others. The people they cared about and those who were at high risk of negative outcomes from COVID infection were included in their worries, even though it was related to a risk assessment. These results are consistent with qualitative research on collaborative problem solving, which found that civic duty is a powerful predictor of compliance and practically impervious to other people's attitudes in a crisis [50]. Comparable to study

on voting habits, people with a strong sense of civic responsibility may see following public health suggestions as a moral duty they must fulfil in order to be a good member [51].

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11479



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11480

