Impact of COVID-19 on Public Knowledge and Attitudes Toward Participating in Clinical Trials in Saudi Arabia: A Cross-Sectional Study

Abdulhadi M Alqahtani1
Saja H Almazrou2
Randah M Alalweet3
Ziyad S Almalki4
Basmah F Alqahtani5
Saleh AlGhamdi1

1Research Center, Clinical Research Department, King Fahad Medical City, Riyadh City, Saudi Arabia; 2Department of Clinical Pharmacy, College of Pharmacy, King Saud University, Riyadh, Saudi Arabia; 3Preventive Health - General Department of Communicable Diseases, Ministry of Health, Riyadh City, Saudi Arabia; 4Department of Clinical Pharmacy, College of Pharmacy, Prince Sattam bin Abdulaziz University, Riyadh, Saudi Arabia; 5Pharmacist, Inpatient Pharmacy, Pharmaceutical Services Administration, King Fahad Medical City, Riyadh City, Saudi Arabia

Objective: We aimed to evaluate the impact of the COVID-19 pandemic on the knowledge and attitudes of patients among the Saudi population toward participating in clinical trials.

Methods: We conducted a descriptive, cross-sectional analysis using self-administered questionnaires for patients who attended the outpatient clinics at King Fahad Medical City and King Saud University Medical City in Riyadh, Saudi Arabia. The questionnaires included general questions about sociodemographic information, patient knowledge about clinical trials, and patient attitudes toward clinical trial participation. We used descriptive analysis to evaluate the impact of COVID-19 on patient knowledge and attitudes about clinical trials.

Results: From November 2019 to October 2020, 822 responses were collected from participants in two medical cities and included in the analysis. Most of the study participants (81%) were younger than age 42 years. Our findings showed no difference between participants who participated in clinical trials before versus during the COVID-19 pandemic (P = 0.129).

Conclusion: The Saudi population knows about clinical trials, but they lack knowledge about the role of the ethics committee and about informed consent. Also, most of them do not have the experience of participating in a clinical trial. Still, they have moderately positive attitudes toward clinical trials.

Keywords: knowledge, attitude, clinical trials, COVID-19, Saudi Arabia

Introduction
Clinical studies are medical experiments aimed at determining the results of patient health when they are participating in the study.1 Depending on the type of study, patients in clinical trials can receive specific treatments. Clinical trial results may provide new information or techniques that can broaden medical knowledge for treatment or diagnostic purposes.2

Participation and enrollment of patients in clinical trials is one of the leading challenges faced by researchers. In 2020, Jin et al published a systematic review to investigate factors affecting people participation in clinical trials.3 The results included 63 studies from various countries and settings. The leading factor affecting participation is the level of trust in research entity and the researcher. Safety issues, include adverse drug reactions, were also perceived as an important factor. In addition, educational level might affect public attitude, studies have found that people with biomedical degrees are more willing to participate compared with other
groups. As for gender and age, young people and men are more willing to participate compared with older adults and women. Finally, having a previous good experience with clinical trials will enhance the chance of future participation.

From this systematic review, there is a wide array of factors that affect people's attitude toward participation in clinical trials. Efforts to enhance the trust in research institutions and researcher and utilizing mass media to reflect on successful experiences might further enhance participation in clinical research.

A multicenter study conducted in some Middle Eastern countries, including Egypt, the Kingdom of Saudi Arabia, and Jordan, showed that approximately 50% of study participants had positive attitudes toward participation in COVID-19 trials. The main factors that influenced public willingness to participate were the ethical conduct of the clinical trials and the desire to protect family members from COVID-19 from accelerating the return to normal life.

From this study, it was clear that people in the Middle East, including Saudi Arabia, are generally receptive to participation in clinical trials. However, the magnitude of change in perception compared with pre-pandemic levels was not measured.

Therefore, we aimed to update the literature about the main factors affecting public decisions to participate in a clinical trial. During the COVID-19 pandemic, we observed huge awareness campaigns through social media to increase knowledge about clinical trials and change public attitudes toward participating in clinical trials. Therefore, we assumed that knowledge and attitudes could change during the COVID-19 pandemic, and we assessed the impact of COVID-19 on the Saudi public's perception of clinical trials and knowledge about clinical trial participation.

**Methods**

**Study Design/Setting**

We conducted a descriptive, cross-sectional analysis using self-administered questionnaires in both Arabic and English languages. The study took place at KFMC and King Saud University Medical City (KSUMC) in Riyadh, Saudi Arabia. The data were collected between November 2019 and October 2020.

**Inclusion and Exclusion Criteria**

Using a convenience sampling approach, we invited patients who attended outpatient clinics to participate. Eligible participants were at least 18 years old and knew the term “clinical trial.” Patients who had abnormal mental health, an acute psychiatric emergency, or a critical illness were excluded.

**Questionnaire Development**

Previous studies similar to ours were reviewed to identify possible factors affecting patient knowledge of and attitudes toward participating in clinical trials. Our questionnaire was then modified to fit the study’s aim.

The questionnaire consisted of 43 questions, which were classified into three sections. The first section consisted of questions about sociodemographic characteristics, such as age, gender, marital status, residential area, number of children (if any), educational level, educational background, reason for the visit, level of health insurance (if any), and regular source of care (if any). The second section evaluated the patient’s knowledge about clinical trials (six questions). Finally, the last section involved questions about the patient’s attitude toward clinical trials (27 questions).

A pilot study was carried out among 10 patients at KFMC to ensure good reliability; Cronbach’s alpha was 0.88, indicating the reliability of our tool, and no substantive changes were made to the questionnaire after the pilot study. We classified the knowledge question (ie, section 2) responses into “yes” and “no” groups. The attitude domain was assessed using a Likert scale (strongly disagree, disagree, neutral, agree, and strongly agree).

**Data Collection**

The questionnaire was administered electronically using Google Forms to facilitate data collection, tracking, and validation. The questionnaire responses were collected by volunteers. The volunteers had medical backgrounds (eg, student or graduate student in medical fields), and four volunteers had access to the questionnaire and collected the data.

**Sample Size**

Our sample size was determined by the number of patients visiting outpatient clinics in KFMC and KSUMC. Overall, 14,736 people visited the outpatient clinics at these two locations. Using that number and the OpenEpi website, we calculated our necessary sample size to achieve a P value of 0.05 as 375 participants.
Statistical Analysis
Data analysis was performed using SPSS 25.0 software (SPSS Inc., Chicago, IL, USA). We used a descriptive-frequency test and the chi-square test to determine the intensity of the correlation between independent variables (age, gender, educational level, and marital status) and the major outcome variable of attention. To improve our analyses, we classified education levels into subgroups of uneducated, elementary school, middle/high school, bachelor’s degree, master’s degree, and doctorate degree.

Ethical Considerations Procedure
This study was conducted in accordance with the Declaration of Helsinki. Permission to conduct this study was obtained from the institutional review board at KFMC (project No. 19-516) and the ethical committee at KSUMC (project No. E-194380). Electronic informed consent was provided by each participant before they answered the questionnaire. Participants did not receive any compensation for participation in the study.

Results
From November 2019 to October 2020, 822 responses from participants in two medical cities were reported and included in the analysis. We aimed to identify and determine the main barriers that affect patient participation in clinical trials in Saudi Arabia.

Table 1 Sociodemographic Information

|                          | Total             | Before COVID19 Pandemic | During COVID19 Pandemic | P-value |
|--------------------------|-------------------|-------------------------|-------------------------|---------|
|                          | n     | %    | n    | %    | n    | %    |         |
| Age                      |       |      |      |      |      |      |         |
| 18–30                    | 388   | 47.2 | 169  | 20.6 | 219  | 26.6 | 0.5     |
| 31–42                    | 286   | 34.8 | 130  | 15.8 | 156  | 19.0 |         |
| 43–54                    | 104   | 12.7 | 53   | 6.4  | 51   | 6.20 |         |
| >54                      | 44    | 5.4  | 17   | 2.1  | 27   | 3.3  |         |
| Gender                   |       |      |      |      |      |      |         |
| Male                     | 337   | 41.0 | 154  | 18.7 | 183  | 22.3 | 0.7     |
| Female                   | 485   | 59.0 | 215  | 26.2 | 270  | 32.9 |         |
| Marital status           |       |      |      |      |      |      |         |
| Single                   | 310   | 37.7 | 135  | 16.4 | 175  | 21.3 | 0.6     |
| Married                  | 512   | 62.3 | 234  | 28.5 | 278  | 33.8 |         |
| Having children          |       |      |      |      |      |      |         |
| Yes                      | 413   | 50.2 | 190  | 23.1 | 223  | 27.1 | 0.5     |
| No                       | 409   | 49.8 | 179  | 21.8 | 230  | 28.0 |         |
| Residential area         |       |      |      |      |      |      |         |
| Village                  | 75    | 9.1  | 33   | 4.0  | 42   | 5.1  | 0.9     |
| City                     | 747   | 90.9 | 336  | 40.9 | 411  | 50.0 |         |
| Educational level        |       |      |      |      |      |      |         |
| Uneducated               | 3     | 8.2  | 1    | 2.7  | 2    | 5.5  | 0.3     |
| Elementary school        | 16    | 1.9  | 10   | 1.2  | 6    | 0.7  |         |
| Middle/high school       | 227   | 27.6 | 93   | 11.3 | 134  | 16.3 |         |
| Bachelor’s degree        | 492   | 59.9 | 233  | 28.4 | 259  | 31.5 |         |
| Master’s degree          | 69    | 8.4  | 27   | 3.3  | 42   | 5.1  |         |
| PhD’s degree             | 15    | 1.8  | 5    | 0.6  | 10   | 1.2  |         |
| Educational background   |       |      |      |      |      |      |         |
| Non-medical field        | 469   | 57.1 | 221  | 26.9 | 248  | 30.2 | 0.6     |
| Medical field            | 120   | 14.6 | 53   | 6.5  | 67   | 8.2  |         |
| Reason of the visit      |       |      |      |      |      |      |         |
| Treatment                | 287   | 34.9 | 134  | 16.3 | 153  | 18.6 | 0.5     |
| Follow-up                | 535   | 65.1 | 235  | 28.6 | 300  | 36.5 |         |
| Regular source of care   |       |      |      |      |      |      |         |
| Government hospitals     | 624   | 75.9 | 283  | 34.4 | 341  | 41.5 | 0.6     |
| Private hospitals        | 198   | 24.1 | 86   | 10.5 | 112  | 13.6 |         |
| Health insurance         |       |      |      |      |      |      |         |
| Yes                      | 224   | 27.3 | 99   | 12.0 | 125  | 15.2 | 0.8     |
| No                       | 598   | 72.8 | 270  | 32.9 | 328  | 39.9 |         |
Most study participants (47.2%) were between 18 and 30 years old. There was no significant difference between participant ages before versus during the pandemic. In our sample, 59% of participants were women. Overall, 37.7% of participants were single and 62.3% were married; 50.2% of married participants had children. Most participants lived in the city (90.9%), had a bachelor’s degree (59.9%), and had a nonmedical background (57.1%). In addition, 24.1% of patients were treated at a private hospital, but the majority (75.9%) received their regular care at governmental hospitals (75.9%); overall, 72.8% of participants had no health insurance (Table 1).

As shown in Table 2, no differences existed between the number of participants who participated in clinical trials before versus during the COVID-19 pandemic (P = 0.129). Also, regarding patient knowledge about clinical trials, most patients (67.2%) had poor knowledge about the ethics committee in general before the pandemic, but knowledge increased significantly (P = 0.02) during the COVID-19 pandemic.

Unfortunately, most patients (75.3%) had poor knowledge about whom to contact for problems or adverse events during the clinical trial. This knowledge increased during the pandemic by 4.9%. A significant difference existed in participant trust of physicians (P = 0.08); 88.1% of participants believed that their physicians could not start a clinical trial without professional approval to protect patients. (Table 2).

In Table 3 shown the participant attitudinal fear from participating in a clinical trial before and during the COVID19 pandemic. We found most responses were worried about they might not receive good health care when they join a clinical trial (p=0.04). Moreover, most of them were afraid about they might the are not able to find transportation to reach them to the clinical trial treatment center (p=0.03).

While most of them were willing to participate if they received benefits, risks, and full information about the trials (p=0.004). Also, most of them were willing to participate in a clinical trial if their physician explained it to them (p=0.003). The majority of them preferred to have more information from their physician about the trial (p=0.007).

**Table 2 The Knowledge About Participating in Clinical Trials**

| Survey Item                                                                 | Total | Before COVID19 Pandemic | During COVID19 Pandemic | P-value |
|----------------------------------------------------------------------------|-------|-------------------------|------------------------|---------|
| Have you been involved in clinical trials before?                          |       |                         |                        |         |
| Yes                                                                       | 67    | 8.2                     | 4.38                   | 0.1     |
| No                                                                        | 755   | 91.9                    | 95.6                   |         |
| Do you think Clinical trials are only used as a last resort?               |       |                         |                        |         |
| Yes                                                                       | 326   | 39.7                    | 16.9                   | 0.1     |
| No                                                                        | 496   | 60.3                    | 83.1                   |         |
| Do you know about the Ethics committee before?                             |       |                         |                        |         |
| Yes                                                                       | 270   | 32.9                    | 12.8                   | 0.02    |
| No                                                                        | 552   | 67.2                    | 87.2                   |         |
| Do you know whom to contact if you have a problem like an adverse event and serious adverse event in a clinical trial? |       |                         |                        |         |
| Yes                                                                       | 203   | 24.7                    | 9.9                    | 0.1     |
| No                                                                        | 619   | 75.3                    | 90.1                   |         |
| Do you think the physician can start a clinical trial without the approval of professionals who protect patient rights? |       |                         |                        |         |
| Yes                                                                       | 98    | 11.9                    | 6.3                    | 0.08    |
| No                                                                        | 724   | 88.1                    | 93.7                   |         |
| Do you know about “Informed consent”?                                      |       |                         |                        |         |
| Yes                                                                       | 308   | 37.5                    | 16.6                   | 0.7     |
| No                                                                        | 514   | 62.5                    | 83.4                   |         |
Table 3 Attitudinal of Fear from Participating in a Clinical Trial

| Survey Item                                                                 | Total | Before COVID19 Pandemic | During COVID19 Pandemic | P-value |
|----------------------------------------------------------------------------|-------|-------------------------|-------------------------|---------|
|                                                                            | n     | %                       | n                        | %       |         |
| I am afraid of the side effects that I will have on a clinical trial.     |       |                         |                          |         |         |
| Strongly agree                                                            | 178   | 21.7                    | 71                       | 8.6     | 107      | 13.01   | 0.3     |
| Agree                                                                     | 315   | 38.3                    | 155                      | 18.9    | 160      | 19.5    |         |
| Neutral                                                                   | 193   | 23.5                    | 83                       | 10.1    | 110      | 13.4    |         |
| Disagree                                                                  | 84    | 10.2                    | 36                       | 4.4     | 48       | 5.8     |         |
| Strongly disagree                                                         | 52    | 6.3                     | 24                       | 2.9     | 28       | 3.4     |         |
| I am worried that the treatment I'd receive on a clinical trial would not work for me. |       |                         |                          |         |         |
| Strongly agree.                                                           | 96    | 11.7                    | 48                       | 5.8     | 48       | 5.8     | 0.4     |
| Agree                                                                     | 273   | 33.2                    | 121                      | 14.7    | 152      | 18.5    |         |
| Neutral                                                                   | 258   | 31.4                    | 106                      | 12.9    | 152      | 18.5    |         |
| Disagree                                                                  | 133   | 16.2                    | 62                       | 7.5     | 71       | 8.6     |         |
| Strongly disagree                                                         | 62    | 7.5                     | 32                       | 3.9     | 30       | 3.6     |         |
| I would not ask about clinical trials unless my doctor brought them up first. |       |                         |                          |         |         |
| Strongly agree.                                                           | 113   | 13.8                    | 54                       | 6.6     | 59       | 7.2     | 0.1     |
| Agree                                                                     | 365   | 44.4                    | 179                      | 21.8    | 186      | 22.6    |         |
| Neutral                                                                   | 145   | 17.6                    | 57                       | 6.9     | 88       | 10.7    |         |
| Disagree                                                                  | 134   | 16.3                    | 50                       | 6.1     | 84       | 10.2    |         |
| Strongly disagree                                                         | 65    | 7.9                     | 29                       | 3.5     | 36       | 4.4     |         |
| I do not like to try new treatments until they have been approved to be used. |       |                         |                          |         |         |
| Strongly agree.                                                           | 279   | 33.9                    | 128                      | 15.6    | 151      | 18.4    | 0.6     |
| Agree                                                                     | 336   | 40.9                    | 158                      | 19.2    | 178      | 21.7    |         |
| Neutral                                                                   | 132   | 16.1                    | 53                       | 6.5     | 79       | 9.6     |         |
| Disagree                                                                  | 50    | 6.1                     | 20                       | 2.4     | 30       | 3.6     |         |
| Strongly disagree                                                         | 25    | 3.0                     | 10                       | 1.2     | 15       | 1.8     |         |
| I do not trust drug companies.                                            |       |                         |                          |         |         |
| Strongly agree.                                                           | 83    | 10.1                    | 38                       | 4.6     | 45       | 5.5     | 0.3     |
| Agree                                                                     | 160   | 19.5                    | 76                       | 9.2     | 84       | 10.2    |         |
| Neutral                                                                   | 306   | 37.2                    | 145                      | 17.6    | 161      | 19.6    |         |
| Disagree                                                                  | 207   | 25.2                    | 79                       | 9.6     | 128      | 15.6    |         |
| Strongly disagree                                                         | 66    | 8.0                     | 31                       | 3.8     | 35       | 4.3     |         |
| I am afraid I will be used as a test subject if I join in a clinical trial. |       |                         |                          |         |         |
| Strongly agree.                                                           | 122   | 14.8                    | 61                       | 7.4     | 61       | 7.4     | 0.3     |
| Agree                                                                     | 296   | 36.01                   | 137                      | 16.7    | 159      | 19.3    |         |
| Neutral                                                                   | 190   | 23.1                    | 75                       | 9.1     | 115      | 14.0    |         |
| Disagree                                                                  | 153   | 18.6                    | 65                       | 7.9     | 88       | 10.7    |         |
| Strongly disagree                                                         | 61    | 7.4                     | 31                       | 3.8     | 30       | 3.7     |         |
| I am worried that going on a clinical trial would burden my family.        |       |                         |                          |         |         |
| Strongly agree.                                                           | 139   | 16.9                    | 60                       | 7.3     | 79       | 9.6     | 0.4     |
| Agree                                                                     | 290   | 35.3                    | 122                      | 14.8    | 168      | 20.4    |         |
| Neutral                                                                   | 176   | 21.4                    | 89                       | 10.8    | 87       | 10.6    |         |
| Disagree                                                                  | 166   | 20.2                    | 72                       | 8.8     | 94       | 11.4    |         |
| Strongly disagree                                                         | 51    | 6.2                     | 26                       | 3.2     | 25       | 3.0     |         |
| I am worried that my family would not allow me to participate in a clinical trial. |       |                         |                          |         |         |
| Strongly agree.                                                           | 143   | 17.4                    | 58                       | 7.1     | 85       | 10.3    | 0.1     |
| Agree                                                                     | 275   | 33.5                    | 123                      | 15.0    | 152      | 18.5    |         |
| Neutral                                                                   | 167   | 20.3                    | 66                       | 8.03    | 101      | 12.3    |         |
| Disagree                                                                  | 168   | 20.4                    | 88                       | 10.7    | 80       | 9.7     |         |
| Strongly disagree                                                         | 69    | 8.4                     | 34                       | 4.1     | 35       | 4.3     |         |

(Continued)
| Survey Item                                                                 | Total                  | Before COVID19 Pandemic | During COVID19 Pandemic | P-value |
|---------------------------------------------------------------------------|------------------------|-------------------------|-------------------------|---------|
|                                                                           | n          | %           | n          | %           | n          | %           |            |         |
| I am worried that my medical care will not be as good if I join a clinical trial. | Strongly agree.       | 89         | 10.8       | 34         | 4.1         | 55         | 6.7         | 0.04     |
|                                                                           | Agree       | 237        | 28.8       | 112        | 13.6        | 125        | 15.2        |          |
|                                                                           | Neutral     | 192        | 23.4       | 81         | 9.9         | 111        | 13.5        |          |
|                                                                           | Disagree    | 213        | 25.9       | 110        | 13.4        | 103        | 12.5        |          |
|                                                                           | Strongly disagree | 91                 | 11.1       | 32         | 3.9         | 59         | 7.2         |          |
| I would not be able to find transportation to get me to my clinical trial treatment center. | Strongly agree.       | 67         | 8.2        | 28         | 3.41        | 39         | 4.7         | 0.03     |
|                                                                           | Agree       | 253        | 30.8       | 128        | 15.6        | 125        | 15.2        |          |
|                                                                           | Neutral     | 268        | 32.6       | 104        | 12.6        | 164        | 20          |          |
|                                                                           | Disagree    | 175        | 21.3       | 87         | 10.6        | 88         | 10.7        |          |
|                                                                           | Strongly disagree | 59                 | 7.2        | 22         | 2.7         | 37         | 4.5         |          |
| I would not be able to keep up with the clinical trial treatment schedule. | Strongly agree.       | 71         | 8.6        | 32         | 3.9         | 39         | 4.7         | 0.5      |
|                                                                           | Agree       | 281        | 34.2       | 138        | 16.8        | 143        | 17.4        |          |
|                                                                           | Neutral     | 225        | 27.4       | 96         | 11.7        | 129        | 15.7        |          |
|                                                                           | Disagree    | 197        | 24         | 82         | 10          | 115        | 14          |          |
|                                                                           | Strongly disagree | 48                 | 5.8        | 21         | 2.6         | 27         | 3.3         |          |
| I do not trust the medical system.                                        | Strongly agree.       | 31         | 3.8        | 13         | 1.6         | 18         | 2.2         | 0.6      |
|                                                                           | Agree       | 73         | 8.9        | 33         | 4.01        | 40         | 4.9         |          |
|                                                                           | Neutral     | 222        | 27.01      | 93         | 11.3        | 129        | 15.7        |          |
|                                                                           | Disagree    | 285        | 34.7       | 139        | 16.9        | 146        | 17.8        |          |
|                                                                           | Strongly disagree | 211                | 25.7       | 91         | 11.1        | 120        | 14.6        |          |
| I do not have time to take part in a clinical trial.                      | Strongly agree.       | 166        | 20.2       | 74         | 9           | 92         | 11.2        | 0.8      |
|                                                                           | Agree       | 282        | 34.3       | 124        | 15.1        | 158        | 19.2        |          |
|                                                                           | Neutral     | 211        | 25.7       | 92         | 11.2        | 119        | 14.5        |          |
|                                                                           | Disagree    | 114        | 13.9       | 57         | 6.9         | 57         | 6.9         |          |
|                                                                           | Strongly disagree | 49                 | 6          | 22         | 2.7         | 27         | 3.3         |          |
| Helping in developing new medications                                    | Strongly agree.       | 144        | 17.5       | 62         | 7.5         | 82         | 10          | 0.1      |
|                                                                           | Agree       | 406        | 49.4       | 196        | 23.8        | 210        | 25.5        |          |
|                                                                           | Neutral     | 153        | 18.6       | 55         | 6.7         | 98         | 11.9        |          |
|                                                                           | Disagree    | 78         | 9.5        | 39         | 4.7         | 39         | 4.7         |          |
|                                                                           | Strongly disagree | 41                 | 5          | 17         | 2.1         | 24         | 3           |          |
| Being part of scientific knowledge                                        | Strongly agree.       | 121        | 14.7       | 55         | 6.7         | 66         | 8.03        | 0.6      |
|                                                                           | Agree       | 387        | 47.1       | 184        | 22.4        | 203        | 24.7        |          |
|                                                                           | Neutral     | 182        | 22.1       | 74         | 9           | 108        | 13.1        |          |
|                                                                           | Disagree    | 88         | 10.7       | 37         | 4.5         | 51         | 6.2         |          |
|                                                                           | Strongly disagree | 44                 | 5.4        | 19         | 2.3         | 25         | 3.04        |          |
| Willing to participate if you were provided with a good consent form explaining the clinical trial’s benefits and risks. | Strongly agree.       | 88         | 10.7       | 53         | 6.5         | 35         | 4.3         | 0.004    |
|                                                                           | Agree       | 334        | 40.6       | 160        | 19.5        | 174        | 21.2        |          |
|                                                                           | Neutral     | 199        | 24.2       | 77         | 9.4         | 122        | 14.8        |          |
|                                                                           | Disagree    | 129        | 15.7       | 49         | 6           | 80         | 9.7         |          |
|                                                                           | Strongly disagree | 72                 | 8.8        | 30         | 3.7         | 42         | 5.1         |          |
Table 3 (Continued).

| Survey Item                                                                 | Total Before COVID19 Pandemic | During COVID19 Pandemic | P-value |
|-----------------------------------------------------------------------------|-------------------------------|-------------------------|---------|
|                                                                             | n    | %  | n    | %  | n    | %  |       |
| Willing to participate in a clinical trial if you were explained in a completely private setting |       |    |       |    |       |    |       |
| Strongly agree.                                                             | 68   | 8.3| 38   | 4.6| 30   | 3.7| 0.1   |
| Agree                                                                      | 288  | 35.0| 140  | 17.03| 148 | 18 |       |
| Neutral                                                                    | 207  | 25.2| 86   | 10.5| 121  | 14.7|       |
| Disagree                                                                   | 175  | 21.3| 71   | 8.6 | 104  | 12.7|       |
| Strongly disagree                                                          | 84   | 10.2| 34   | 4.14| 50   | 6.08|       |
| Willing to participate in a clinical trial if your physician explained you |       |    |       |    |       |    |       |
| Strongly agree.                                                             | 65   | 7.9| 39   | 4.7| 26   | 3.2| 0.003 |
| Agree                                                                      | 295  | 35.9| 148  | 18  | 147  | 17.9|       |
| Neutral                                                                    | 209  | 25.4| 88   | 10.7| 121  | 14.7|       |
| Disagree                                                                   | 167  | 20.3| 63   | 7.7 | 104  | 12.7|       |
| Strongly disagree                                                          | 86   | 10.5| 31   | 3.7 | 55   | 6.7 |       |
| Having religious representatives in the clinical trial and an ethics committee will make you more likely to participate in the clinical trial. |       |    |       |    |       |    |       |
| Strongly agree.                                                             | 70   | 8.5| 31   | 3.8| 39   | 4.7| 0.9   |
| Agree                                                                      | 216  | 26.3| 100  | 12.2| 116  | 14.1|       |
| Neutral                                                                    | 258  | 31.4| 114  | 13.9| 144  | 17.5|       |
| Disagree                                                                   | 186  | 22.6| 85   | 10.3| 101  | 12.3|       |
| Strongly disagree                                                          | 92   | 11.2| 39   | 4.7 | 53   | 6.5 |       |
| A belief that by participating in a clinical trial, you will receive the best medical care |       |    |       |    |       |    |       |
| Strongly agree.                                                             | 71   | 8.6| 34   | 4.14| 37   | 4.5| 0.4   |
| Agree                                                                      | 312  | 38  | 152  | 18.5| 160  | 19.5|       |
| Neutral                                                                    | 266  | 32.4| 112  | 13.6| 154  | 18.7|       |
| Disagree                                                                   | 125  | 15.2| 50   | 6.1 | 75   | 9.1 |       |
| Strongly disagree                                                          | 48   | 5.8 | 21   | 2.6 | 27   | 3.3 |       |
| Willing to participate in a clinical trial if you were with a family member when a researcher explains clinical trial. |       |    |       |    |       |    |       |
| Strongly agree.                                                             | 33   | 4.01| 17   | 2.1 | 16   | 2  | 0.5   |
| Agree                                                                      | 239  | 29.1| 114  | 13.9| 125  | 15.2|       |
| Neutral                                                                    | 250  | 30.4| 114  | 13.9| 136  | 16.5|       |
| Disagree                                                                   | 220  | 26.8| 93   | 11.3| 127  | 15.5|       |
| Strongly disagree                                                          | 80   | 9.7 | 31   | 3.8 | 49   | 6  |       |
| Willing to participate in a clinical trial if you had more time to think about it. |       |    |       |    |       |    |       |
| Strongly agree.                                                             | 54   | 6.6| 33   | 4.01| 21   | 2.6| 0.01  |
| Agree                                                                      | 299  | 36.4| 148  | 18  | 151  | 18.4|       |
| Neutral                                                                    | 185  | 22.5| 73   | 8.9 | 112  | 13.6|       |
| Disagree                                                                   | 195  | 23.7| 81   | 9.9 | 114  | 13.9|       |
| Strongly disagree                                                          | 89   | 10.8| 34   | 4.14| 55   | 6.7 |       |
| Willing to participate in a clinical trial if you could obtain information from your physician |       |    |       |    |       |    |       |
| Strongly agree.                                                             | 58   | 7.1| 37   | 4.5| 21   | 2.6| 0.007 |
| Agree                                                                      | 338  | 41.1| 159  | 19.3| 179  | 21.8|       |
| Neutral                                                                    | 187  | 22.7| 82   | 9.9 | 105  | 12.8|       |
| Disagree                                                                   | 155  | 18.9| 61   | 7.4 | 94   | 11.4|       |
| Strongly disagree                                                          | 84   | 10.2| 30   | 3.6 | 54   | 6.6 |       |
| I completely trust my doctor’s recommendations about a clinical trial       |       |    |       |    |       |    |       |
| Strongly agree.                                                             | 69   | 8.4| 33   | 4.01| 36   | 4.4| 0.4   |
| Agree                                                                      | 346  | 42.1| 162  | 19.7| 184  | 22.4|       |
| Neutral                                                                    | 247  | 30.1| 108  | 13.1| 139  | 17  |       |
| Disagree                                                                   | 123  | 15  | 55   | 6.7 | 68   | 8.3 |       |
| Strongly disagree                                                          | 37   | 4.5 | 11   | 1.3 | 26   | 3.2 |       |
about the process of informed consent and about the role of the ethics committee increased during the pandemic.

Only a few studies in Saudi Arabia have been conducted to assess factors that affect participation in clinical trials.5,6 A study conducted by Al-Tannir et al found that 80% of the participants considered clinical trials essential for improving patient care and scientific knowledge.5 Regarding informed consent in that study, most participants reported awareness of confidentiality, expected risks, and benefits; however, knowledge about possible compensation, rights, and consequences of withdrawal was lower.5

Another study by Al-Rawashdeh et al found that the vast majority of participants were unaware of the institutional review board.6 Evidence from these studies cannot be extrapolated to the setting of our study. During the COVID-19 pandemic, the number of clinical trials has greatly increased.9 Therefore, public knowledge and attitudes toward enrollment in clinical trials are expected to increase simultaneously. In this study, participants were more receptive to the benefits of clinical trials during COVID-19. In addition, study participants demonstrated higher levels of trust in the health care system compared with previously reported levels. Abu-Farha et al assessed the public perception of clinical trials during COVID-19;10 68% and 73% of the Jordanian public were willing to participate in COVID-19 clinical trials to find treatment and return to normal life respectively. This high percentage reflects the increased societal responsibility of the general public toward COVID-19 trials.

This study was one of the few studies, to our knowledge, that assessed the general public’s perception and knowledge of clinical trials during COVID-19.10 This study had some limitations. First, this study was conducted in two medical cities in Riyadh. Second, the vast majority of participants were relatively young and educated. Therefore, results cannot be generalizable to different age groups, educational levels, or settings. Moreover, the survey was self-administered, therefore the risk of social desirability bias might be introduced.11 Finally, the research questionnaire was developed by the research team. Future studies should aim to develop a standardized tool which enables researchers to quantify the public attitude to clinical trials which in turn help in assessing the impact of policies and intervention that affect patients recruitment.

Social media has a major role in educating the public about clinical trials and COVID-19.12,13 Simple, jargon-free language can explain the various aspects of clinical trials, including the potential benefits and risks. In addition, encouraging clinical trial participants to share their experiences could help recruit future eligible participants. These interactions should be

| Survey Item                                      | Total | Before COVID19 Pandemic | During COVID19 Pandemic | P-value |
|--------------------------------------------------|-------|-------------------------|-------------------------|---------|
|                                                   | n     | %                       | n                       | %       |         |
| I am worried about the safety of participating in a clinical trial |       |                         |                         |         |
| Strongly agree.                                  | 131   | 15.9                    | 64                      | 7.8     | 67       | 8.2     | 0.02 |
| Agree                                           | 336   | 40.9                    | 169                     | 20.6    | 167      | 20.3    |      |
| Neutral                                         | 236   | 28.7                    | 94                      | 11.4    | 142      | 17.3    |      |
| Disagree                                        | 84    | 10.2                    | 31                      | 3.8     | 53       | 6.5     |      |
| Strongly disagree                               | 35    | 4.3                     | 11                      | 1.3     | 24       | 2.9     |      |
| I trust the information I read about a clinical trial on the internet |       |                         |                         |         |
| Strongly agree.                                  | 28    | 3.4                     | 9                       | 1.1     | 19       | 2.3     | 0.2  |
| Agree                                           | 138   | 16.8                    | 59                      | 7.16    | 79       | 9.6     |      |
| Neutral                                         | 299   | 36.4                    | 125                     | 15.2    | 174      | 21.2    |      |
| Disagree                                        | 253   | 30.8                    | 124                     | 15.1    | 129      | 15.7    |      |
| Strongly disagree                               | 104   | 12.7                    | 52                      | 6.3     | 52       | 6.3     |      |
| Clinical trial medications are safer than other medication |       |                         |                         |         |
| Strongly agree.                                  | 23    | 2.8                     | 7                       | 0.9     | 16       | 2       | 0.3  |
| Agree                                           | 96    | 11.7                    | 39                      | 4.7     | 57       | 6.9     |      |
| Neutral                                         | 312   | 37.9                    | 152                     | 18.5    | 160      | 19.5    |      |
| Disagree                                        | 256   | 31.1                    | 114                     | 13.9    | 142      | 17.3    |      |
| Strongly disagree                               | 135   | 16.4                    | 57                      | 6.9     | 78       | 9.5     |      |
regulated by entities that manage patient and public involvement in clinical trials. The involvement of patients and the public in improving awareness about clinical trials represents a substantial role in bridging the gap between researchers and the public. Efforts to reach patients can involve reviewing study documents to assess their appropriateness and clarity for the study participants, evaluating patient experiences, and disseminating study results to the public. In addition, the National Committee of Bioethics, the Ministry of Health, or research centers must conduct several awareness campaigns about the role of ethics committees and introduce patients who were enrolled in clinical trials before the community to transfer their experience about clinical trials.

**Conclusion**

The COVID-19 pandemic has had no impact on patient knowledge about clinical trials; however, the pandemic did have a slight impact on patient attitudes toward participating in clinical trials. The Saudi population knows about clinical trials but lacks knowledge about the role of the ethics committee and about informed consent. Also, most people do not have the experience of participating in a clinical trial. Still, they maintain moderately positive attitudes toward clinical trials. The conclusion needs to be interpreted with caution due to small sample and the high representation of young, educated subjects in comparison with other population groups.

**Disclosure**

The authors report no conflicts of interest for this work.

**References**

1. World health organization (WHO). Clinical trials [Internet]. Available from: https://www.who.int/health-topics/clinical-trials/#tab=tab_1. Accessed June 29, 2021.

2. U.S. National Institutes of Health. Learn about clinical studies - ClinicalTrials.gov [Internet]. ClinicalTrials.gov. 2012. Available from: https://clinicaltrials.gov/ct2/about-studies/learn. Accessed June 29, 2021.

3. Jin H, Cui M, Liu J. Factors affecting people’s attitude toward participation in medical research: a systematic review. *Curr Med Res Opin.* 2020;36(7):1137–1143. doi:10.1080/03007995.2020.1760807

4. Samir Abdelhafiz A, Elhafeez S, Khalil M, et al. Factors influencing participation in COVID-19 clinical trials: a Multi-National Study. *Front Med.* 2021;8.

5. Al-Tannir MA, El-Bakri N, Abu-Shaheen AK. Knowledge, attitudes and perceptions of saudis towards participating in clinical trials. *PLoS One.* 2016;11(2):e0143893. doi:10.1371/journal.pone.0143893

6. Al-Rawashdeh N, Damsees R, Al-Jeraisy M, Al Qasim E, Deeb AM. Knowledge of and attitudes toward clinical trials in Saudi Arabia: a cross-sectional study. *BMJ Open.* 2019;9(10):e031305. doi:10.1136/bmjopen-2019-031305

7. Schmotzer GL. Barriers and facilitators to participation of minorities in clinical trials. *Ethn Dis.* 2012;22(2):226–230.

8. Dean AG, Sullivan KM, Soe MM. OpenEpi: open source statistics for public health, Version 3.01.; 2013. Available from: www.OpenEpi.com. Accessed June 29, 2021.

9. Gianola S, Jesus TS, Bargeri S, Castellini G. Characteristics of academic publications, preprints, and registered clinical trials on the COVID-19 pandemic. *PLoS One.* 2020;15(10):e0240123. doi:10.1371/journal.pone.0240123

10. Abu-Farha RK, Alzoubi KH, Khabour OF. Public willingness to participate in COVID-19 vaccine clinical trials: a study from Jordan. *Patient Prefer Adherence.* 2020;14:2451–2458. doi:10.2147/PPA.S284385

11. Marcano Belisario JS, Jamsek J, Huckvale K, O’Donoghue J, Morrison CP, Car J. Comparison of self-administered survey questionnaire responses collected using mobile apps versus other methods. *Cochrane Database Syst Rev.* 2015;2015(7):MR000042.

12. Thompson MA. Social Media in Clinical Trials. *Am Soc Clin Oncol Educ B.* 2014;34:e101–e105. doi:10.14694/EdBook_AM.2014.34.e101

13. Adella Halim D, Kurniawan A, Agung FH, et al. Understanding of young people about COVID-19 during early outbreak in Indonesia. *Asia Pac J Public Health.* 2020;32(6–7):363–365. doi:10.1177/101559520940933

14. Sacristán JA, Aguarón A, Avenida-Solá C, et al. Patient involvement in clinical research: why, when, and how. *Patient Prefer Adherence.* 2016;631. doi:10.2147/PPA.S104259