









Article

Monkeypox Post-COVID-19: Knowledge, Worrying, and Vaccine Adoption in the Arabic General Population

Sarya Swed ¹, Haidara Bohsas ¹, Hidar Alibrahim ¹, Amine Rakab ², Wael Hafez ³, Bisher Sawaf ⁴, Rais Mohammed Amir ⁵, Ahmed Sallam Motawei ^{6,7}, Ahmed Aljabali ⁸ , Shiekh Shoib ^{9,10}, Ismail Atef Ismail Ahmed Ibrahim ¹¹, Sondos Hussein Ahmad Almashaqbeh ¹² , Ebrahim Ahmed Qaid Shaddad ¹³ , Maryam Alqaisi ¹⁴, Ahmed Abdelrahman ¹⁵, Sherihan Fathey ¹⁶, René Hurlemann ^{17,18,19}, Mohamed E. G. Elsayed ^{17,20} , Joshuan J. Barboza ^{21,*}, Aroop Mohanty ^{22,*} , Alfonso J. Rodriguez-Morales ^{23,24,25} , Bijaya Kumar Padhi ^{17,26}  and Ranjit Sah ^{27,28} 

- ¹ Faculty of Medicine, Aleppo University, Aleppo 15310, Syria
 - ² Clinical Medicine, Weill Cornell Medical College, Al-Rayyan 36623, Qatar
 - ³ NMC Royal Hospital, 16th Street, Khalifa, Abu Dhabi 35233, United Arab Emirates; Medical Research Division, Department of Internal Medicine, The National Research Centre, Cairo 11511, Egypt
 - ⁴ Department of Internal Medicine, Syrian Private University, Damascus 20872, Syria
 - ⁵ Faculty of Medicine of Algiers, University of Algiers 1, Alger Centre 16000, Algeria
 - ⁶ Department of Neurosurgery, Qena University Hospitals, South Valley University, Qena 83511, Egypt
 - ⁷ Department of Ophthalmology, University of California, Los Angeles, CA 90089, USA
 - ⁸ Faculty of Medicine, Jordan University of Science and Technology, Ar-Ramtha 72764, Jordan
 - ⁹ JLNH Hospital, Rainawari, Srinagar 190001, India
 - ¹⁰ Directorate of Health Services, Jammu and Kashmir 184121, India
 - ¹¹ Department of Physical Therapy and Rehabilitation, Fenerbahçe Üniversitesi, Istanbul 34758, Turkey
 - ¹² University of Jordan, Amman 11110, Jordan
 - ¹³ Faculty of Medicine, Sana'a University, Sana'a 1247, Yemen
 - ¹⁴ MSH Statistics, Cairo 45785, Egypt
 - ¹⁵ Internal Medicine Department, Faculty of Medicine, Zagazig University, Zagazig 44519, Egypt
 - ¹⁶ Department of Health, Giza 12511, Egypt
 - ¹⁷ Department of Psychiatry, School of Medicine and Health Sciences, Carl von Ossietzky University Oldenburg, 26122 Oldenburg, Germany
 - ¹⁸ Department of Psychiatry, University Hospital Bonn, 53229 Bonn, Germany
 - ¹⁹ Research Center Neurosensory Science, Carl von Ossietzky University Oldenburg, 26122 Oldenburg, Germany
 - ²⁰ Department of Psychiatry and Psychotherapy III, University of Ulm, Leimgrubenweg, 89075 Ulm, Germany
 - ²¹ Escuela de Medicina, Universidad César Vallejo, Trujillo 13007, Peru
 - ²² Department of Clinical Microbiology, All India Institute of Medical Sciences, Gorakhpur 273008, India
 - ²³ Grupo de Investigación Biomedicina, Faculty of Medicine, Fundación Universitaria Autónoma de las Américas—Institución Universitaria Visión de las Américas, Pereira 660003, Risaralda, Colombia
 - ²⁴ Clinical Epidemiology and Biostatistics, School of Medicine, Universidad Científica del Sur, Lima 4861, Peru
 - ²⁵ Gilbert and Rose-Marie Chagoury School of Medicine, Lebanese American University, Beirut P.O. Box 36, Lebanon
 - ²⁶ Department of Community Medicine and School of Public Health, Postgraduate Institute of Medical Education and Research, Chandigarh 160012, India
 - ²⁷ Department of Clinical Microbiology, Institute of Medicine, Tribhuvan University Teaching Hospital, Kathmandu 44600, Nepal
 - ²⁸ Department of Clinical Microbiology, DY Patil Medical College, Hospital and Research Centre, DY Patil Vidyapeeth, Pune 411000, India
- * Correspondence: jbarbozame@ucvvirtual.edu.pe (J.J.B.); aroopmohanty7785@yahoo.com (A.M.)



Citation: Swed, S.; Bohsas, H.; Alibrahim, H.; Rakab, A.; Hafez, W.; Sawaf, B.; Amir, R.M.; Motawei, A.S.; Aljabali, A.; Shoib, S.; et al. Monkeypox Post-COVID-19: Knowledge, Worrying, and Vaccine Adoption in the Arabic General Population. *Vaccines* **2023**, *11*, 759. <https://doi.org/10.3390/vaccines11040759>

Academic Editor: Vincenzo Baldo

Received: 27 January 2023

Revised: 16 February 2023

Accepted: 1 March 2023

Published: 29 March 2023



Copyright: © 2023 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

Abstract: Background: The outbreak of monkeypox was declared a global public health emergency by the World Health Organization on 23 July 2022. There have been 60,000 cases reported worldwide, most of which are in places where monkeypox has never been seen due to the travel of people who have the virus. This research aims to evaluate the general Arabic population in regard to the monkeypox disease, fears, and vaccine adoption after the WHO proclaimed a monkeypox epidemic and to compare these attitudes to those of the COVID-19 pandemic. Methods: This cross-sectional study was performed in some Arabic countries (Syria, Egypt, Qatar, Yemen, Jordan, Sudan, Algeria,

and Iraq) between 18 August and 7 September 2022. The inclusion criteria were the general public residing in Arabic nations and being older than 18. This questionnaire has 32 questions separated into three sections: sociodemographic variables, prior COVID-19 exposure, and COVID-19 vaccination history. The second portion assesses the knowledge and anxieties about monkeypox, while the third section includes the generalized anxiety disorder (GAD7) scale. Logistic regression analyses were performed to compute the adjusted odds ratios (aOR) and their confidence intervals (95%CI) using STATA (version 17.0). Results: A total of 3665 respondents from 17 Arabic countries were involved in this study. Almost two-thirds ($n = 2427$, 66.2%) of the participants expressed more worry about COVID-19 than monkeypox diseases. Regarding the major cause for concern about monkeypox, 39.5% of participants attributed their anxiety to the fear that they or a member of their family may contract the illness, while 38.4% were concerned about monkeypox becoming another worldwide pandemic. According to the GAD 7 score, 71.7% of the respondents showed very low anxiety toward monkeypox and 43.8% of the participants scored poor levels of knowledge about monkeypox disease. Participants with previous COVID-19 infection showed a 1.206 times greater acceptance to receive the monkeypox vaccine than those with no previous infection. A 3.097 times higher concern for monkeypox than COVID-19 was shown by the participants who perceived monkeypox as dangerous and virulent than those who did not. Participants who have a chronic disease (aOR: 1.32; 95%CI: 1.09–1.60); participants worried about monkeypox (aOR: 1.21; 95%CI: 1.04–1.40), and perceived monkeypox as a dangerous and virulent disease (aOR: 2.25; 95%CI: 1.92–2.65); and excellent knowledge level (aOR: 2.28; 95%CI: 1.79–2.90) have emerged as significant predictors. Conclusions: Our study reported that three-fourths of the participants were more concerned about COVID-19 than monkeypox disease. In addition, most of the participants have inadequate levels of knowledge regarding monkeypox disease. Hence, immediate action should be taken to address this problem. Consequently, learning about monkeypox and spreading information about its prevention is crucial.

Keywords: monkeypox; COVID-19; knowledge; vaccine adoption; fear; anxiety

1. Introduction

The outbreak of monkeypox was declared a global public health emergency condition by the World Health Organization (WHO) on 23 July 2022. The majority of the reported cases were from Europe [1]. Since the beginning of the COVID-19 epidemic, nearly two-million fatalities have occurred worldwide. Extensive research has shown a correlation between COVID-19 and mental health problems, such as anxiety, depression, and mental distress. This association increased as the worldwide number of COVID-19 cases and fatalities increased [2]. The monkeypox virus is a double-stranded DNA virus that can spread from animals to humans. It is in the genus *Orthopoxvirus* and the family *Poxviridae* [3]. There are approximately 21,504 cases in the US, but only 35 cases have been reported from Arabic countries [4]. Multiple animal hosts for this virus have been discovered, including rope squirrels, tree squirrels, Gambian pouched rats, dormice, and many kinds of monkeys [5]. Transmission is considered to occur by exposure to infected animals or people (animal to human/human to human). Body fluids, respiratory excretions, contact with cutaneous or mucosal lesions, and exposure to contaminated items are all transmission tracts for this disease [1,2]. The predicted incubation time for monkeypox ranges between 5 and 21 days. The initial illness signs are vague, including fever, chills, headaches, lymphadenopathy, back pain, myalgia, and, eventually, the appearance of a rash [6]. This disease has been linked to several complications, including bacterial superinfection of the skin, pneumonia, encephalitis, sepsis, and death [7]. Psychiatric and neurological manifestations might also occur [8]. In most cases, monkeypox infections heal without medical treatment. Oral or intravenous rehydration is advised to maintain hydration levels in patients with digestive symptoms, such as vomiting and diarrhea. Several antiviral drugs, including tecovirimat, brincidofovir, and cidofovir,

have been shown to be effective against the monkeypox virus [9]. There has been evidence of the vaccine's effectiveness in protecting against the monkeypox virus. Modified vaccinia Ankara and ACAM2000 are the two vaccines that have been established [10]. Recent research has shown that the general public is more concerned about COVID-19 than about monkeypox. Deaths from monkeypox have not been documented in areas where the disease is not naturally present, lending credence to the idea that the current outbreak's clinical repercussions are less severe than those seen in endemic areas [11,12]. However, there is still a gap in the literature of the assessment of the knowledge and the psychological behaviors toward the monkeypox illness and whether there is a more significant worry about it as the number of recorded cases increases. This research aims to evaluate Arabic people's perspectives on monkeypox disease, their fears, and their vaccine adoption after the WHO proclaimed a monkeypox epidemic, and to compare these attitudes to those of the COVID-19 pandemic.

2. Methods

2.1. Study Design

A cross-sectional online study was performed in 17 Arabic countries (Syria, Egypt, Qatar, Yemen, Jordan, Sudan, Algeria, Iraq, and other countries) between 18 August and 7 September 2022, to examine the Arabic people's perspectives on the monkeypox disease, their fears, and their vaccine adoption, and to compare these attitudes to those of the COVID-19 pandemic. The participants were required to be individuals of the general public residing in Arabic nations and older than 18 years. Medical professionals, students, and staff were not eligible for participation. All of the participants were informed of the study's goals, the researchers' identities, their ability to opt out of participation, the confidentiality and security of their data, and the importance of providing all of the requested information. This questionnaire was constructed using a complete, verified scale based on previous research [11,13]. The survey was then translated from English into Arabic for the respondent's comprehension by a native translator. Due to concerns about security, a Google form survey was developed and distributed over social media sites, such as Facebook, WhatsApp, and Telegram. In addition, in the individual governorates, retail malls, parks, public squares, and other public meeting areas were accessible for data collection, as were face-to-face interviews.

2.2. Sample Size Calculation

Depending on the Arab population count (<https://data.worldbank.org/indicator/SP.POP.TOTL?locations=1A>, accessed on 1 December 2021), and using Calculator.net (<https://www.calculator.net/sample-size-calculator.html>, accessed on 1 December 2021), we conducted a statistical power analysis for sample size calculation using a population proportion of 50%, a margin of error of 0.05, and a degree of confidence of 99%, so the minimum sample size was 385. The overall sample size was 3822 participants.

2.3. Measures

This questionnaire has 32 questions separated into three sections: sociodemographic factors, prior COVID-19 exposure, and COVID-19 vaccination history. The second portion assesses the participants' knowledge and anxieties about Monkeypox, while the third section includes the Generalized Anxiety Disorder (GAD7) scale in reference to the monkeypox virus [14]. The utilized questionnaire is supplied as a "Supplementary Material".

2.4. Sociodemographic Characteristics

This section contains six questions regarding the participant's sociodemographic characteristics, including age, gender, place of residence, marital status, economic status, and chronic illness status (hypertensive, diabetes, etc.). This section also includes three questions about the participants' prior exposure to COVID-19, including whether or not they have ever been infected with the virus, whether or not they took preventative

measures against contracting the disease during the COVID-19 pandemic, and whether or not they are more concerned about a possible outbreak of monkeypox than the COVID-19 epidemic.

2.5. Knowledge and Concerns about Monkeypox

There are 11 multiple-choice questions here on the monkeypox virus that participants may answer yes, no, or not sure to gauge their level of familiarity with Monkeypox. The participants were asked whether they believed that monkeypox was caused by a virus or bacteria, whether it could be spread from person to person, whether its symptoms were similar to those of smallpox, whether its rash and papules were indicative of the disease, and whether antibiotics were effective against the virus. Extensive prior research uses of this instrument attest to its reliability [13]. There are also three questions in this section that assess how worried people are about monkeypox and related issues (such as whether or not the virus is serious enough to warrant taking precautions to avoid spreading it and whether or not people should be quarantined worldwide). In addition, this section includes two questions to assess the participants' willingness to obtain the monkeypox vaccination and to identify the most probable receivers. This question was extracted from a previously verified survey [11].

2.6. Generalized Anxiety Disorder (GAD) toward Monkeypox

This tool consists of seven validated questions to assess the GAD of the participants towards the monkeypox virus [14]. In this tool, the respondents were asked to assess the frequency with which they had experienced symptoms such as worry, concern, restlessness, impatience, and dread during the previous two weeks. We gave values between 0 and 3 to the following frequency categories: never, sometimes, often, and very frequently. The GAD7 scores were tallied and classified as minimal (0–4), mild (5–9), moderate (10–14), and severe (15–21).

2.7. Pilot Study

We administered the questionnaire to 50 Arabic individuals, selected randomly to ensure its validity and readability, and we detected high levels of internal consistency (Cronbach's alpha varied from 0.712 to 0.861). In addition, we modified the questionnaire according to the individuals' feedback. However, these 50 responses were excluded from the sample that was eligible for the analysis.

Ethical Consideration: Ethical Approval is taken from the Syrian Arab Republic, Aleppo city, Faculty of Medicine, Aleppo University. The IRB approval number is SA-AL 4853B.

The Syrian Ethical Society for Scientific Research provided its stamp of approval (SA-AL4853B). Furthermore, at least one ethical approval was taken from each of the inquired country in our study. The participants were given a Google Survey URL and asked to confirm their agreement to participate in the study on the first page of the survey. There is a wealth of background reading for the participants to peruse before they fill out the questionnaire on the next page and complete this survey within 5–12 min. The responses were collected and kept in an encrypted internet database.

2.8. Statistical Analysis

The statistical data analysis was conducted using the IBM SPSS statistical analysis tool (28). Means and standard deviations were used in the process of describing the continuous variables, while frequencies and percentages were utilized in the process of describing the categorically measured variables. Multivariate Binary Logistic Regression Analysis was used so that the investigators could determine which variables could be responsible for people's concerns over monkeypox and their willingness to be vaccinated against the disease. An odds ratio (OR) with accompanying 95% confidence intervals was used to represent the connection between the predictors and the outcome-dependent variables

in the multivariate Logistic Binary regression analysis. p -value ≤ 0.05 was considered a statistically significant value.

3. Results

The demographic variables of the respondents are summarized in Table 1. A total of 3772 responses from 17 Arabic countries were collected in this study; however, the final eligible sample size for data analysis, after omitting the missing data, was 3665. The highest proportion of the inquired participants was from Yemen ($n = 689$, 18.8%), followed by Syria ($n = 394$, 10.8%). More than half of the participants were female (2187, 59.7%). Most of the respondents ($n = 3016$, 82.3%) were aged between 18–34. Nearly two-thirds of the study participants were single (2249, 61.4%). Regarding their economic status, 56.1% ($n = 2055$) of the respondents had a moderate economic condition, while 30.6% ($n = 1123$) had a good economic condition. The majority of the participants (84.0%, $n = 3078$) had no history of chronic disease.

Table 1. Sociodemographic characteristics of participants ($n = 3665$).

| Variable | Frequency | Percentage |
|---------------------|-----------|------------|
| Country | | |
| Yemen | 689 | 18.8% |
| Algeria | 335 | 9.1% |
| Syria | 394 | 10.8% |
| Jordan | 801 | 21.9% |
| Egypt | 577 | 15.7% |
| Sudan | 444 | 12.1% |
| Qatar | 43 | 1.2% |
| Saudi Arabia | 107 | 2.9% |
| Iraq | 127 | 3.5% |
| Oman | 18 | 0.5% |
| United Arab Emirate | 54 | 1.5% |
| Lebanon | 7 | 0.2% |
| Somalia | 19 | 0.5% |
| Palestine | 12 | 0.3% |
| Kuwait | 25 | 0.7% |
| Libya | 7 | 0.2% |
| Morocco | 6 | 0.2% |
| Sex | | |
| Female | 2187 | 59.7% |
| Male | 1477 | 40.3% |
| Age Groups | | |
| 18–34 years | 3016 | 82.3% |
| 35–44 years | 414 | 11.3% |
| 45–54 years | 141 | 3.8% |
| 55–64 years | 94 | 2.6% |
| Marital Status | | |
| Single | 2249 | 61.4% |
| Married | 1321 | 36.0% |
| Divorced | 53 | 1.4% |
| Widowed | 42 | 1.1% |
| Residence | | |
| Countryside | 818 | 22.3% |
| City | 2847 | 77.7% |
| Income | | |
| Bad | 191 | 5.2% |
| Moderate | 2055 | 56.1% |
| Good | 1123 | 30.6% |
| Excellent | 296 | 8.1% |
| Chronic Disease | | |
| No | 3078 | 84.0% |
| Yes | 587 | 16.0% |

Regarding Table 2, 45.8% ($n = 1679$) of the participants reported a previous infection of the COVID-19 disease; additionally, about half of the participants (51.9%, $n = 1903$) reported a medium commitment during the COVID-19 pandemic. Almost two-thirds ($n = 2427$, 66.2%) of the participants expressed more worry about COVID-19 than monkeypox diseases. Regarding the major cause for concern about Monkeypox, 39.5% of the participants attributed their anxiety to the fear that they or a family member may contract the illness, while 38.4% were concerned about another worldwide pandemic being caused by Monkeypox. Overall, 69.9% of the respondents agreed that Monkeypox is a dangerous and virulent illness that requires respiratory and contact precautions. According to the GAD 7 score, 71.7% of the respondents showed very low anxiety toward monkeypox. However, 43.8% of the study sample scored poor levels of knowledge regarding monkeypox disease (Table 2).

Table 2. Respondents' attitudes, perceptions, and beliefs about Monkeypox disease ($n = 3665$).

| Variable | Frequency | Percentage |
|---|-------------|------------|
| Have you been affected by the COVID-19 disease? | | |
| No | 1986 | 54.2% |
| Yes | 1679 | 45.8% |
| Participant's and family members compliance with COVID-19 pandemic precautions | | |
| Rarely committed | 602 | 16.4% |
| Medium commitment | 1903 | 51.9% |
| Always committed | 1160 | 31.7% |
| Worry from Monkeypox compared to COVID-19 | | |
| Much worried with the COVID-19 | 2427 | 66.2% |
| More worried with Monkeypox | 1238 | 33.8% |
| Main reasons for your worry from Monkeypox disease | | |
| Self and family worry of Monkeypox infection | 1447 | 39.5% |
| Worry from another worldwide pandemic | 1409 | 38.4% |
| Worried that Monkeypox might surge to cause a national lockdown | 400 | 10.9% |
| Concerned that an international flight suspension happens | 79 | 2.2% |
| Other worries | 330 | 9.0% |
| Do you perceive Monkeypox as a dangerous and virulent disease that calls for respiratory and contact precautions? | | |
| No | 1102 | 30.1% |
| Yes | 2563 | 69.9% |
| GAD7 Score, Mean (SD) | 3.15 (4.46) | – |
| GAD7 Score Levels | | |
| Very low Anxiety | 2627 | 71.7% |
| Mild Anxiety | 621 | 16.9% |
| Moderate Anxiety | 321 | 8.8% |
| High Anxiety | 96 | 2.6% |
| Overall Monkeypox Disease Knowledge score, mean (SD). Maximum Score = 11 | 3.99 (2.87) | – |
| Overall Monkeypox Disease Knowledge Score Levels | | |
| Poor | 1604 | 43.8% |
| Good | 1668 | 45.5% |
| Excellent | 393 | 10.7% |

Ten out of fourteen of the predicted variables were statistically significantly associated with more willingness to vaccinate against Monkeypox ($p < 0.05$). The respondents aged

between 35–44 years had fewer odds of willingness to receive the monkeypox vaccine compared to the 18–34 age group (OR = 0.715). In comparison to those who were single, married respondents were projected to have less acceptance of the monkeypox vaccination (OR = 0.855). The participants with excellent income were 2.069 times more likely to receive the vaccine than those with bad income. Participants who had a previous COVID-19 infection showed a 1.206 times greater acceptance to receive the monkeypox vaccine than those with no previous infection. Regarding the main reasons for worry about Monkeypox disease, the participants who expressed worry that Monkeypox might surge to cause a national lockdown, who were concerned that an international flight suspension would happen, and who reported other reasons of worry had a significant drop in vaccination acceptability, by 0.016, 0.027, and <0.001 times, respectively, than those who expressed concern that they or a member of their family could contract the illness. A 1.889 times higher agreement for the monkeypox vaccine was expected by the participant who perceived Monkeypox as dangerous and virulent more than those who did not (Table 3).

Table 3. Multivariate Binary Logistic Regression Analysis of people’s odds of agreement to vaccinate against Monkeypox Disease, (Agree versus Disagree).

| Predictor | Adjusted Odds Ratio | 95% Confidence Interval | | p Value |
|--|---------------------|-------------------------|-------|----------|
| | | Lower | Upper | |
| Sex | | | | |
| Female–Male | 0.857 | 0.731 | 1.005 | 0.058 |
| Age Groups | | | | |
| 35–44–18–34 years | 0.715 | 0.555 | 0.922 | 0.01 * |
| 45–54–18–34 years | 0.612 | 0.408 | 0.918 | 0.018 * |
| 55–64–18–34 years | 0.843 | 0.527 | 1.348 | 0.475 |
| Marital Status | | | | |
| Married–Single | 0.855 | 0.718 | 1.019 | 0.08 |
| Divorced–Single | 0.6 | 0.331 | 1.091 | 0.094 |
| Widowed–Single | 0.952 | 0.481 | 1.885 | 0.887 |
| Residence | | | | |
| City–Countryside | 0.81 | 0.678 | 0.968 | 0.021 * |
| Income | | | | |
| Moderate–Bad | 1.159 | 0.834 | 1.611 | 0.38 |
| Good–Bad | 1.278 | 0.905 | 1.805 | 0.163 |
| Excellent–Bad | 2.069 | 1.371 | 3.122 | <0.001 * |
| Chronic Disease | | | | |
| Yes–No | 1.193 | 0.976 | 1.458 | 0.085 |
| Previous COVID-19 infection | | | | |
| Yes–No | 1.206 | 1.031 | 1.411 | 0.019 * |
| Participant and family members compliance | | | | |
| Medium commitment–Rarely committed | 0.871 | 0.711 | 1.066 | 0.181 |
| Always committed–Rarely committed | 1.012 | 0.804 | 1.275 | 0.916 |
| Worry from Monkeypox compared to COVID19 | | | | |
| More worried with Monkeypox–Much worried with the COVID-19 | 1.111 | 0.948 | 1.302 | 0.193 |

Table 3. Cont.

| Predictor | Adjusted Odds Ratio | 95% Confidence Interval | | p Value |
|--|---------------------|-------------------------|-------|----------|
| | | Lower | Upper | |
| Main reasons for your worry from Monkeypox disease | | | | |
| Worry from another worldwide pandemic–Self and family worry of Monkeypox infection | 0.949 | 0.809 | 1.115 | 0.526 |
| Worried that Monkeypox might surge to cause a national lockdown–Self and family worry of Monkeypox infection | 0.74 | 0.579 | 0.945 | 0.016 * |
| Concerned that an international flight suspension happens–Self and family worry of Monkeypox infection | 0.56 | 0.335 | 0.935 | 0.027 * |
| Other worries–Self and family worry of Monkeypox infection | 0.461 | 0.349 | 0.607 | <0.001 * |
| Do you perceive Monkeypox as a dangerous and virulent | | | | |
| Yes–No | 1.889 | 1.591 | 2.243 | <0.001 * |
| Total Knowledge Score | 1.099 | 1.07 | 1.128 | <0.001 * |
| Total GAD Score | 1.045 | 1.028 | 1.064 | <0.001 * |

* *p* value significant if it is equal to or less than 0.05.

Eight out of fourteen of the predictor factors were significantly linked with greater worry about Monkeypox than COVID-19 (*p*-value < 0.05). Females were more 1.379 times more likely to be concerned about Monkeypox than males. Participants aged 35–44 had low odds of worry about Monkeypox compared to those 18–34. Low worries were predicted among the participants with chronic disease, 0.731 times more than those without. Regarding the main reasons for worry about the Monkeypox disease, the participants who expressed worry that Monkeypox might surge to cause another worldwide pandemic had a significant drop, by 0.723 times, in worry about Monkeypox than those who expressed concern that they or a member of their family could contract the illness. A 3.097 times higher concern for Monkeypox than COVID-19 was shown by the participants who perceived Monkeypox as dangerous and virulent than those who did not (Table 4).

Table 5 depicts the multiple logistic regression analysis findings for the association between the intention to vaccinate and the socio-behavioral characteristics of the study participants. The participants who have a chronic disease (aOR: 1.32; 95%CI: 1.09–1.60), participants worried about Monkeypox (aOR: 1.21; 95%CI: 1.04–1.40), those who perceived monkeypox as a dangerous and virulent disease (aOR: 2.25; 95%CI: 1.92–2.65), and those with an excellent knowledge level (aOR: 2.28; 95%CI: 1.79–2.90) emerged as significant predictors.

Table 4. Multivariate Binary Logistic Regression Analysis of respondents' odds of higher worry level from Monkeypox disease compared to COVID-19.

| Predictor | Adjusted Odds Ratio | 95% Confidence Interval | | p Value |
|--|---------------------|-------------------------|-------|----------|
| | | Lower | Upper | |
| Sex | | | | |
| Female–Male | 1.379 | 1.1611 | 1.638 | <0.001 * |
| Age Groups | | | | |
| 35–44–18–34 years | 0.721 | 0.5453 | 0.953 | 0.022 * |
| 45–54–18–34 years | 0.964 | 0.6228 | 1.491 | 0.867 |
| 55–64–18–34 years | 0.977 | 0.573 | 1.666 | 0.932 |
| Marital Status | | | | |
| Married–Single | 1.177 | 0.9779 | 1.418 | 0.085 |
| Divorced–Single | 0.814 | 0.4218 | 1.571 | 0.54 |
| Widowed–Single | 1.417 | 0.6728 | 2.984 | 0.359 |
| Residence | | | | |
| City–Countryside | 0.921 | 0.761 | 1.115 | 0.398 |
| Income | | | | |
| Moderate–Bad | 0.834 | 0.5879 | 1.182 | 0.307 |
| Good–Bad | 0.857 | 0.5936 | 1.237 | 0.409 |
| Excellent–Bad | 1.058 | 0.6877 | 1.627 | 0.798 |
| Chronic Disease | | | | |
| Yes–No | 0.731 | 0.5881 | 0.909 | 0.005 * |
| Previous COVID-19 infection | | | | |
| Yes–No | 0.898 | 0.759 | 1.062 | 0.21 |
| Participant and family members compliance | | | | |
| Medium commitment–Rarely committed | 1.205 | 0.9622 | 1.508 | 0.104 |
| Always committed–Rarely committed | 0.968 | 0.7523 | 1.245 | 0.798 |
| Main reasons for your worry from Monkeypox disease | | | | |
| Worry from another worldwide pandemic–Self and family worry of Monkeypox infection | 0.723 | 0.6091 | 0.858 | <0.001 * |
| Worried that Monkeypox might surge to cause a national lockdown–Self and family worry of Monkeypox infection | 1.07 | 0.8248 | 1.388 | 0.61 |
| Concerned that an international flight suspension happens–Self and family worry of Monkeypox infection | 0.869 | 0.5023 | 1.502 | 0.614 |
| Other worries–Self and family worry of Monkeypox infection | 1.038 | 0.775 | 1.39 | 0.802 |
| Do you perceive Monkeypox as a dangerous and virulent | | | | |
| Yes–No | 3.097 | 2.5221 | 3.803 | <0.001 * |
| Do you agree to be vaccinated by monkeypox vaccine | | | | |
| No–Yes | 1.107 | 0.9437 | 1.298 | 0.212 |
| Total Knowledge Score | 1.066 | 1.0367 | 1.096 | <0.001 * |
| Total GAD Score | 1.114 | 1.0953 | 1.134 | <0.001 * |

* p value significant if it is equal to or less than 0.05.

Table 5. Multiple logistic regression analysis for the association between intention to vaccinate and socio-behavioral characteristics of study participants ($n = 3664$).

| Variable | aOR [95% CI] | <i>p</i> -Value |
|--|-------------------|-----------------|
| Age (Reference: 18–34) | | |
| 35–44 | 0.65 [0.51, 0.83] | 0.00 * |
| 45–54 | 0.59 [0.40, 0.87] | 0.01 * |
| 55–64 | 0.86 [0.54, 1.36] | 0.51 |
| Gender (Reference: male) | | |
| Female | 1.08 [0.93, 1.24] | 0.31 |
| Marital Status (Reference: Single) | | |
| Married | 0.88 [0.74, 1.03] | 0.11 |
| Divorced | 0.76 [0.42, 1.36] | 0.35 |
| Widowed | 0.99 [0.51, 1.93] | 0.97 |
| Residence (Reference: Countryside) | | |
| City | 0.76 [0.65, 0.90] | 0.00 * |
| Chronic Disease (Reference: No) | | |
| Yes | 1.32 [1.09, 1.60] | 0.00 * |
| Previous COVID19 Infection (Reference: No) | | |
| Yes | 1.08 [0.94, 1.23] | 0.31 |
| Participant’s and family members compliance with COVID-19 pandemic precautions (Reference: Rarely committed) | | |
| Medium commitment | 0.83 [0.69, 1.01] | 0.06 |
| Always committed | 0.88 [0.71, 1.08] | 0.22 |
| Worry from Monkeypox compared to COVID-19 (Reference: Much worried with the COVID-19) | | |
| More worried with Monkeypox | 1.21 [1.04, 1.40] | 0.01* |
| Do you perceive Monkeypox as a dangerous and virulent disease that calls for res (Reference: No) | | |
| Yes | 2.25 [1.92, 2.65] | 0.00 * |
| Knowledge of Monkeypox (Reference: Poor) | | |
| Good | 1.62 [1.39, 1.87] | 0.00 * |
| Excellent | 2.28 [1.79, 2.90] | 0.00 * |

* *p* value significant if it is equal to or less than 0.05.

4. Discussion

The recent spread of global health pandemics is one of the major problems facing humanity and affecting the world in various aspects of life [15]. The COVID-19 pandemic during the last three years is the best example of the extent to which humanity might be affected by such outbreaks. Accordingly, the recent announcement by the WHO of the possibility of facing the threat of a new global pandemic (i.e., Monkeypox (MPX) as a Public Health Emergency of International Concern) [16] during our confrontation with the COVID-19 pandemic encourages the world to be vigilant and take the necessary precautionary measures to avoid the recurrence of the tragedy of the Corona-virus pandemic and other previous intractable pandemics. However, this caution may result in episodes of anxiety and depression of varying degrees among the mass of people that may repeat what they have experienced during the harsh conditions of the COVID-19 pandemic [17–20].

In our cross-sectional online survey, we assessed the level of anxiety among a sample of the Arab population following the Monkeypox virus (MPXV) prevalence in some Arab countries. Less than half (45.8%) of the participants confirmed a COVID-19 infection history, while slightly more than half (51.9%) reported a medium commitment and average rules followed during the COVID-19 pandemic. This constant compliance with coronavirus control measures is crucial for the continued education and awareness messages concerning the Monkeypox disease. Despite the increase in MPX cases in Arab countries [4], very low anxiety concerning this rising health problem was recorded among most participants (71.7%) according to the GAD7 score. This may be attributed to people’s low level of

knowledge about the disease, as we found that 43.8% of the participants recorded a poor level of knowledge about the disease.

The small number of cases of Monkeypox and the rarity of men who engage in male-to-male sex in Arabic-speaking nations may have impacted our findings by lowering people's awareness and fear of the disease. Accordingly, it is necessary to conduct awareness campaigns about its transmission methods, as well as prevention and management for the public through the media and in schools at different stages. In addition, with the world still facing the COVID-19 pandemic at present and since 2020, we compared the levels of public worry about the MPX epidemic with that of the COVID-19 pandemic.

We found that most participants (66.2%) worried more about COVID-19 than MPX. However, more concern and worry about MPX was paid among some groups of the participants than their equivalents (e.g., females (OR = 1.379), participants aged 18–34, participants without a chronic disease (OR = 1.368), more details in the results). The COVID-19 mental disorders collaborators reported similar findings in their large systematic review about the prevalence of major depressive disorders and anxiety disorders induced by the COVID-19 pandemic [17]. However, the reasons for anxiety about MPX differ from those for COVID-19. We found that most of the anxiety in our study stemmed from their fear that they or a member of their family might be infected with MPXV or worry about another worldwide pandemic and its consequences. In contrast, the study population reported a fear of international flight suspension as the less worrying factor. The major worries during COVID-19 were the high mortality rates and morbidities associated with the disease [17,21].

Although no specific vaccine protects against MPXV, many orthopoxvirus vaccines have been found to cross-protect against MPXV by antigenic similarity [22,23]. Smallpox vaccines have great efficacy in preventing MPX infection, with a clinical effectiveness of about 85% [24]. According to the CDC, two smallpox vaccines (ACAM2000 AND JYNNEOS) are approved to protect against both smallpox and MPX in the USA [25]. Monkeypox vaccination can be either pre-exposure or post-exposure immunization [22,24,25]. While a pre-exposure vaccination can reduce the risk of catching the infection, a post-exposure vaccination within 4–14 days can ameliorate the symptoms of the disease and help with rapid recovery [24].

Based on our analysis, a large percentage of the respondents to our survey showed acceptance of the MPXV vaccination. Thus, an effective measure that can help control the outbreak in the Arab world is the implementation of vaccination for high-risk groups and the ring vaccination (i.e., vaccination of direct contacts of confirmed infected people [24,26]). Taking this into consideration, the previous experience of the COVID-19 pandemic stresses the importance of implementing strong vaccination strategies. Based on Watson et al.'s analysis of the global impact induced by COVID-19 vaccination, millions of deaths were avoided after the vaccination, with an estimated global reduction of 63% of the total deaths within the first year of vaccination [27]. With a major global event such as the 2022 FIFA World Cup in Qatar, strict precautions must be taken to avoid the spread of MPX and thus to avoid facing the risk of a new global pandemic, in addition to the current COVID-19 one [28].

This might include: (1) raising awareness and knowledge about the disease through social media and educational campaigns; (2) conducting screening tests for travelers before entering the country; (3) emphasizing the ability of the healthcare system to manage the situation; (4) the rapid diagnosis and control of any new cases; and (5) taking the MPXV vaccination strategy into consideration [29].

Finally, Ennab et al. and Sah et al. presented some of the commandments and lessons learned from the COVID-19 pandemic, which we can benefit from to reduce the risk of facing a new health crisis [30,31].

The concern and worry of the Arab population in the MENA region being average, reasonable, and not exaggerated should not lead to neglect that will result in a new pandemic. Whilst the Monkeypox infection appears to cause less mortality than the

COVID-19 infection, the symptoms tend to be more severe and difficult. Moreover, the world health authorities are already weakened by the coronavirus pandemic, which imposes a strong preparation for a probable second pandemic in the 21st century caused by Monkeypox [21].

More global future studies are needed to determine the specific concerns about the Monkeypox virus pandemic and to define the knowledge gaps towards the Monkeypox virus, which helps the community to properly face any predicted pandemic. Strengths and limitations.

Although cross-sectional studies are inexpensive and can be easily accomplished, and analytical cross-sectional surveys may be used to study the relationship between a potential risk factor and a health result, the credibility of the assumptions that can be made about the relationship between a risk factor and a health result from this kind of research is limited. Furthermore, those who live in distant areas, do not have access to the internet, or are elderly will not be able to participate in the research by completing the online survey. In our study, an investigator was assigned to each country that we asked about to continuously review the data collection procedure and omit the random and multiple auto-responses. In addition, we did not include healthcare professionals or medical students. Delivering the questionnaire to people with no internet services, people with no smartphones, and people in inadequate internet and electricity service areas were important challenges during this study.

5. Conclusions

Overall, our results have shown knowledge gaps of the Monkeypox virus among the general population in Arabic countries, especially among people who have previously been affected by COVID-19; however, those with good knowledge of Monkeypox show lower levels of concern about new cases of Monkeypox in Arabic countries than those for COVID-19. The two most significant determinants, the rarity of males who partake in male-to-male sex in Arabic-speaking regions and the low number of monkeypox cases, may have affected our results by reducing people's knowledge and fear of the virus. Healthcare providers should be knowledgeable about raising the knowledge of Monkeypox among the general population, specifically the signs and symptoms and the available diagnostic methods for this disease. Permanent screening programs should be conducted for people coming from endemic areas and people with high-risk infection levels, such as the LGBTQ community.

In addition, the historical experience of the COVID-19 pandemic highlights how essential it is to adopt effective vaccination and preventive policies.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/vaccines11040759/s1>, THE QUESTIONNAIRE.

Author Contributions: S.S. (Sarya Swed), H.B. and H.A.; Methodology, A.R., W.H., B.S., R.M.A., A.S.M., A.A. (Ahmed Aljabali), S.S. (Shiekh Shoib), I.A.I.A.I., S.H.A.A. and E.A.Q.S.; Writing—original draft preparation, M.A., A.A. (Ahmed Abdelrahman), S.F., R.H. and M.E.G.E.; Writing—review and editing, J.J.B., A.M., A.J.R.-M., B.K.P. and R.S. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Ethical Approval is taken from the Syrian Arab Republic, Aleppo city, Faculty of Medicine, Aleppo University. The IRB approval number is SA-AL 4853B.

Informed Consent Statement: Not applicable.

Data Availability Statement: The analyzed data is available for the readers upon responsible request from the first author or the corresponding author.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. WHO. Monkeypox Outbreak. Available online: <https://www.who.int/europe/news/item/23-07-2022-who-director-general-declares-the-ongoing-monkeypox-outbreak-a-public-health-event-of-international-concern> (accessed on 23 July 2022).
2. Jones, E.A.K.; Mitra, A.K.; Bhuiyan, A.R. Impact of COVID-19 on Mental Health in Adolescents: A Systematic Review. *Int. J. Environ. Res. Public Health* **2021**, *18*, 2470. [CrossRef]
3. Kaler, J.; Hussain, A.; Flores, G.; Kheiri, S.; Desrosiers, D. Monkeypox: A Comprehensive Review of Transmission, Pathogenesis, and Manifestation. *Cureus* **2022**, *14*, e26531. [CrossRef] [PubMed]
4. CDC. Monkeypox Outbreak Global Map. 2022. Available online: <https://www.cdc.gov/poxvirus/monkeypox/response/2022/world-map.html> (accessed on 4 August 2022).
5. WHO. Monkeypox Facts. Available online: <https://www.who.int/news-room/fact-sheets/detail/monkeypox> (accessed on 19 May 2022).
6. Peter, O.J.; Kumar, S.; Kumari, N.; Oguntolu, F.A.; Oshinubi, K.; Musa, R. Transmission dynamics of Monkeypox virus: A mathematical modelling approach. *Model. Earth Syst. Environ.* **2022**, *8*, 3423–3434. [CrossRef]
7. Moore, M.; Zahra, F. Monkeypox. In *StatPearls*; StatPearls Publishing LLC.: Treasure Island, FL, USA, 2022.
8. Farahat, R.A.; Shrestha, A.B.; Elsayed, M.; Memish, Z.A. Monkeypox vaccination: Does it cause neurologic and psychiatric manifestations?—Correspondence. *Int. J. Surg.* **2022**, *106*, 106926. [CrossRef]
9. Rizk, J.G.; Lippi, G.; Henry, B.M.; Forthal, D.N.; Rizk, Y. Prevention and Treatment of Monkeypox. *Drugs* **2022**, *82*, 957–963. [CrossRef]
10. See, K.C. Vaccination for Monkeypox Virus Infection in Humans: A Review of Key Considerations. *Vaccines* **2022**, *10*, 1342. [CrossRef] [PubMed]
11. Temsah, M.-H.; Aljamaan, F.; Alenezi, S.; Alhasan, K.; Saddik, B.; Al-Barag, A.; Alhaboob, A.; Bahabri, N.; Alshahrani, F.; Alrabiaah, A.; et al. Monkeypox caused less worry than COVID-19 among the general population during the first month of the WHO Monkeypox alert: Experience from Saudi Arabia. *Travel Med. Infect. Dis.* **2022**, *49*, 102426. [CrossRef]
12. Kmiec, D.; Kirchhoff, F. Monkeypox: A New Threat? *Int. J. Mol. Sci.* **2022**, *23*, 7866. [CrossRef] [PubMed]
13. Sallam, M.; Al-Mahzoum, K.; Dardas, L.A.; Al-Tammemi, A.a.B.; Al-Majali, L.; Al-Naimat, H.; Jardaneh, L.; AlHadidi, F.; Al-Salahat, K.; Al-Ajlouni, E.; et al. Knowledge of Human Monkeypox and Its Relation to Conspiracy Beliefs among Students in Jordanian Health Schools: Filling the Knowledge Gap on Emerging Zoonotic Viruses. *Medicina* **2022**, *58*, 924. Available online: <https://www.mdpi.com/1648-9144/58/7/> (accessed on 11 July 2022).
14. Ruiz, M.A.; Zamorano, E.; García-Campayo, J.; Pardo, A.; Freire, O.; Rejas, J. Validity of the GAD-7 scale as an outcome measure of disability in patients with generalized anxiety disorders in primary care. *J. Affect Disord.* **2011**, *128*, 277–286. [CrossRef]
15. Shang, Y.; Li, H.; Zhang, R. Effects of Pandemic Outbreak on Economies: Evidence from Business History Context. *Front. Public Health* **2021**, *9*, 632043. Available online: <https://www.frontiersin.org/articles/10.3389/fpubh.2021.632043> (accessed on 11 July 2022).
16. Multi-Country Monkeypox Outbreak in Non-Endemic Countries. Available online: <https://www.who.int/emergencies/disease-outbreak-news/item/2022-DON385> (accessed on 21 May 2022).
17. COVID-19 Mental Disorders Collaborators. Global prevalence and burden of depressive and anxiety disorders in 204 countries and territories in 2020 due to the COVID-19 pandemic. *Lancet* **2021**, *398*, 1700–1712. [CrossRef]
18. Rahman, M.A.; Islam, S.M.S.; Tungpunkom, P.; Sultana, F.; Alif, S.M.; Banik, B.; Salehin, M.; Joseph, B.; Lam, L.; Watts, M.C.; et al. COVID-19: Factors associated with psychological distress, fear, and coping strategies among community members across 17 countries. *Glob. Health* **2021**, *17*, 117. [CrossRef]
19. Shehata, G.A.; Gabra, R.; Eltellawy, S.; Elsayed, M.; Gaber, D.E.; Elshabrawy, H.A. Assessment of Anxiety, Depression, Attitude, and Coping Strategies of the Egyptian Population during the COVID-19 Pandemic. *J. Clin. Med.* **2021**, *10*, 3989. [CrossRef]
20. Elsayed, M.; Schönfeldt-Lecuona, C.; Welte, X.A.; Dardeer, K.T.; Kamal, M.A.; Abdelnaby, R.; Rudek, M.A.; Riedel, E.; Denking, M.; Gahr, M.; et al. Psychological Distress, Fear and Coping Strategies During the Second and Third Waves of the COVID-19 Pandemic in Southern Germany. *Front. Psychiatry* **2022**, *13*, 860683. [CrossRef] [PubMed]
21. Ayhan-Balik, C.H.; Karakaya, S.; Kutlu, F.Y. Factors affecting anxiety and depression during the first wave of the COVID-19 pandemic: A cross-sectional study of three different populations. *Egypt J. Neurol. Psychiatr. Neurosurg.* **2022**, *58*, 74. [CrossRef]
22. Sah, R.; Mohanty, A.; Hada, V.; Singh, P.; Govindaswamy, A.; Siddiq, A.; Reda, A.; Dhama, K. The Emergence of Monkeypox: A Global Health Threat. *Cureus* **2022**, *14*, e29304. [CrossRef]
23. Chakraborty, S.; Mohapatra, R.K.; Chandran, D.; Alagawany, M.; Sv, P.; Islam, M.A.; Chakraborty, C.; Dhama, K. Monkeypox vaccines and vaccination strategies: Current knowledge and advances. An update—Correspondence. *Int. J. Surg.* **2022**, *105*, 106869. [CrossRef] [PubMed]
24. Poland, G.A.; Kennedy, R.B.; Tosh, P.K. Prevention of monkeypox with vaccines: A rapid review. *Lancet Infect Dis.* **2022**, *22*, e349–e358. [CrossRef] [PubMed]
25. Vaccines | Mpox | Poxvirus | CDC. Available online: <https://www.cdc.gov/poxvirus/monkeypox/vaccines/vaccine-basics.html> (accessed on 31 January 2023).
26. Choudhary, O.P.; Priyanka; Fahrni, M.L.; Saied, A.A.; Chopra, H. Ring vaccination for monkeypox containment: Strategic implementation and challenges. *Int. J. Surg.* **2022**, *105*, 106873. [CrossRef]

27. Watson, O.J.; Barnsley, G.; Toor, J.; Hogan, A.B.; Winskill, P.; Ghani, A.C. Global impact of the first year of COVID-19 vaccination: A mathematical modelling study. *Lancet Infect. Dis.* **2022**, *22*, 1293–1302. [[CrossRef](#)] [[PubMed](#)]
28. Sah, R.; Alshahrani, N.Z.; Shah, P.; Mohanty, A.; Rouniyar, R.; Shah, S.; Padhi, B.K.; Amer, F.A.; Mayta-Tristan, P.; Rodriguez-Morales, A.J. FIFA World Cup 2022 in Qatar: Mitigating the risk of imported infections amid the COVID-19 pandemic, monkeypox outbreak and other emerging diseases. *Travel Med. Infect. Dis.* **2022**, *50*, 102450. [[CrossRef](#)] [[PubMed](#)]
29. Farahat, R.A.; Setti, M.O.; Benmelouka, A.Y.; Ali, I.; Umar, T.P.; Alabdallat, Y.; Abdelaal, A.; Dergaa, I. Monkeypox emergence and hosting a safe FIFA World Cup 2022 in Qatar: Challenges and recommendations. *Int. J. Surg.* **2022**, *106*, 106935. [[CrossRef](#)]
30. Ennab, F.; Nawaz, F.A.; Narain, K.; Nchasi, G.; Essar, M.Y. Rise of monkeypox: Lessons from COVID-19 pandemic to mitigate global health crises. *Ann Med. Surg.* **2022**, *79*, 104049. [[CrossRef](#)] [[PubMed](#)]
31. Sah, R.; Padhi, B.K.; Siddiq, A.; Abdelaal, A.; Reda, A.; Ismail Lashin, B.; Mohanty, A.; Alshahrani, N.Z.; Rodriguez-Morales, A.J. Public Health Emergency of International Concern declared by the World Health Organization for Monkeypox. *Glob. Secur. Health Sci. Policy* **2022**, *7*, 51–56. [[CrossRef](#)]

Disclaimer/Publisher’s Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.