Original Article

Awareness and Knowledge about Monkeypox Disease among General Adult Population in Jeddah City, Saudi Arabia

Hanaa A. Alasslani[1], Tahani A. Alasslani[2], Wejdan A. Alharbi[3]

[1]Family Medicine Specialist, Primary Health Care, Jeddah, Saudi Arabia, [2]Laboratory Specialist, King Fahad General Hospital, Jeddah, Saudi Arabia, [3]Family Medicine Specialist, Ministry of Health, Jeddah, Saudi Arabia

Abstract

Background: Assessment of awareness and knowledge of the general population regarding Monkeypox is rarely investigated on a global level. The World Health Organization (WHO) reported a lack of knowledge about monkeypox as one of the main challenges facing authorities in implementing effective preventive strategies. This study aims to assess the awareness and knowledge of the general adult population about Monkeypox disease. **Subjects and Methods:** An online population-based cross-sectional study was carried out in Jeddah, Saudi Arabia, among a snowball sample of adult persons (>18 years old). A self-administered online Arabic and English questionnaires was utilized in this study. It consists of three main parts: sociodemographic characteristics of the patients, perception towards Monkeypox disease and assessment of the knowledge about Monkeypox disease through 23 multiple-choice questions with "Yes", "No" and "don't know" responses. **Results:** A total of 387 adults were included in the study. Females represented 72.6% of them. Almost two-thirds (63.8%) aged between 26 and 45 years. More than half (55.6%) of the participants believed that monkeypox will affect social and economic life like the COVID-19 pandemic while 30.7% considered Monkeypox as a conspiracy or bioterrorism. Overall, almost half (50.4%) of the participants expressed excellent level of knowledge, whereas only 4.4% had poor level of knowledge. The highest level of excellent knowledge about Monkeypox disease was observed among participants in the age group 26–45 years (55.1%), whereas the lowest was observed among those in the age group 46–60 years (39.7%), $P = 0.001$. More educated participants (university/postgraduates) were more knowledgeable about Monkeypox disease as 53.5% of them had excellent level of knowledge compared to 33.3% of those below secondary school educational level, $P = 0.047$. **Conclusion:** The knowledge of the general population about Monkeypox is acceptable. However, defective knowledge was observed regarding the fact that Monkeypox is not a new infection that appeared in the year 2022 as well as about the availability of a monkeypox vaccine in Saudi Arabia. Therefore, it is recommended to organize educational activities about the disease for general population targeted mainly lower educated and elderly subjects.

Keywords: General population, knowledge, Monkeypox, perception, Saudi Arabia

Introduction

Monkeypox is a very rare non-fetal zoonotic disease (i.e., transmitted from animals to human) caused by Monkeypox virus infection, which is part of the same family of viruses such as the virus that causes smallpox (variola virus).[1]

Human Monkeypox disease was first discovered in the Democratic Republic of Congo, 1970 in a 12 years old child. Since that time, the disease was limited to the West Africa; however, recently new epidemics was discovered in the United States of America and Sudan.[2] In Saudi Arabia, the first

Address for correspondence: Dr. Hanaa A. Alasslani, Family Medicine Specialist, Primary Health Care, Jeddah, Saudi Arabia.
E-mail: Hanno.harbi@gmail.com

Received: 21-06-2023 **Revised:** 07-08-2023
Accepted: 01-11-2023 **Published:** 04-04-2024

Access this article online

Quick Response Code:

Website: http://journals.lww.com/JFMPC

DOI: 10.4103/jfmpc.jfmpc_1026_23

How to cite this article: Alasslani HA, Alasslani TA, Alharbi WA. Awareness and Knowledge about monkeypox disease among general adult population in jeddah city, Saudi Arabia. J Family Med Prim Care 2024;13:997-1003.

monkeypox case was discovered in a person who came from Europe in July 2022 in Riyadh.[3]

Monkeypox presents usually with fever accompanied by malaise, fatigue headache, back pain and skin rash, which are similar to those of smallpox, except for lymphadenopathy.[4,5] Furthermore, the disease is characterized by its vesiculopustular rash with all stages (macular, papular, vesicular and pustular), which differentiates it from other diseases with vesiculopustular rash.[5,6]

The Monkeypox infection has an incubation period range between 5 and 21 days and is mainly transmitted through droplets and contact with skin lesions or bodily materials and fluids contaminated with the virus.[7] Also, it can be transmitted from mother to fetus.[8,9] It is a self-limited disease and symptoms usually disappear within two to three weeks.[6,10]

Up till now, there is no available vaccine or treatment for Monkeypox disease as the Modified Vaccinia Ankara-Bavarian Nordic (MVA-BN) and tecovirimat drugs are still unavailable on a wide scale, despite being approved.[11] In addition, the cross-protection of childhood smallpox vaccines against monkeypox is limited among adults aged over 40 years. Moreover, younger individuals from non-endemic areas have lower immunity to Monkeypox disease.

As primary care healthcare staff may be the first line of contact with monkeypox cases,[12] recognition of the defective points in knowledge as regards the disease is very important in creating applicable and accessible education programmes at primary care level to help in the prevention of this serious infectious disease. Thus, this study aims to assess the awareness and knowledge of the general adult population in Jeddah City, Western Kingdom of Saudi Arabia (KSA) about Monkeypox disease.

Material and Methods

Study design

It was an online population-based cross-sectional study.

Study area/setting

The study was carried out in Jeddah, which is the second-largest city in Saudi Arabia after the capital Riyadh, with a population of about 4,697,000 people according to estimated 2021 census.[13]

Target population and eligibility criteria

Adult persons (>18 years old) currently living in Jeddah City constituted the study population, provided that they have the study eligibility criteria.

Inclusion criteria

- Adults (>18 years old)
- Males and females
- Currently living in Jeddah, Saudi Arabia
- Saudi and non-Saudi nationals
- Having an internet access

Exclusion criteria

- Individuals younger than 18 years
- Severely ill persons
- Having no internet access
- Those working in medical field (physicians, nurses, technicians and students)

Sample size

The sample size was estimated using an Online Raosoft sample size calculator with the assumptions that the prevalence of good level knowledge regarding Monkeypox disease was 48% as observed in a recent study carried out in Saudi Arabia,[14] a confidence limit was 95% and margins of errors as 5%. Accordingly, the minimum required sample size was 377 patients. This sample will be increased by 10% to compensate for possible none or incomplete responses. Thus, a total of around 415 adults were targeted.

Sampling technique

A Snowball sampling technique was adopted. The questionnaire (both Arabic and English forms) was distributed through Google Forms. The link to the questionnaire was sent through WhatsApp and other social media to the contacts of the researchers. The respondents were asked to roll out the survey to as many individuals as possible, provided that they have the inclusion criteria. On clicking the link the respondents got auto-directed to the study information and consent form. This method allowed us to collect data from different regions of Jeddah City in a short time.

Data collection instrument and technique

A self-administered online Arabic and English questionnaire was utilized in this study. It consists of three main parts:

1. Sociodemographic characteristics of the patients (age, gender, residence, nationality, marital status, educational level, employment status and monthly income in Saudi Riyals).
2. Perception towards Monkeypox disease (believing that Monkeypox will affect social and economic life and thinking regarding the suggestion that Monkeypox is a conspiracy or bioterrorism)

Assessment of the knowledge about Monkeypox disease through 23 multiple-choice questions with "Yes", "No" and "don't know" responses. It was validated in a previous Saudi recent study[13] and adopted from existing facts of the Centers for Disease Control and Prevention (CDC).[15] Correct responses were assigned a score of "1", whereas incorrect and don't know responses were assigned a score of "0". Total score and its percentage for each participant were computed. Then, the percentage of the overall knowledge score was categorized as poor (<50%), good (50–<70%) and excellent (≥70%).

Ethical considerations

- Permission to use the questionnaire was requested from the corresponding author through a personal communication.
- Online consent was requested from all participants in the questionnaire.
- Approval by the research and ethical committee in General Administration for Research and Studies, Administration of Health Affairs, Ministry of Health, Jeddah, Saudi Arabia, was obtained
- Confidentiality was maintained all throughout the research steps.
- The researcher explained the purpose of the study in an online statement before data collection.

Data entry and statistical design

The data were collected and verified by hand and then coded before computerized data entry. The Statistical Package for Social Sciences (SPSS) software version 28.0 (IBM Corporation, Armonk, NY, USA) was used for data entry and analysis. Descriptive statistics (e.g., number, percentage) and analytic statistics using Chi-square test were applied. Multiple regression analysis was used to determine the significant predictors of knowledge of Monkeypox disease. *P* values ≤ 0.05 were considered as statistically significant.

Results

Demographic characteristics of the participants

A total of 387 adults were included in the study. Their demographic characteristics are summarized in Table 1. Females represented 72.6% of them. Almost two-thirds (63.8%) aged between 26 and 45 years. Majority are living in the city (88.6%) and are Saudi nationals (95.6%). Most of them (69.9%) were married and university/postgraduates (72.9%). More than half (56.1%) were governmental employees, whereas 18.1% were housewives/not working. The monthly income of 31.5% of them exceeded 16000 Saudi Riyals/month.

Table 1: Demographic characteristics of the participants (*n*=387)

Variables	Categories	Frequency	Percentage
Gender	Male	106	27.4
	Female	281	72.6
Age in years	18-25	50	12.9
	26-45	247	63.8
	46-60	78	20.2
	>60	12	3.1
Residence	Village	44	11.4
	City	343	88.6
Nationality	Saudi	370	95.6
	Non-Saudi	17	4.4
Marital status	Single	85	22.0
	Married	271	69.9
	Divorced	25	6.5
	Widowed	6	1.6
Educational level	Below secondary school	21	5.4
	Secondary school/ intermediate Diploma	84	21.7
	University/postgraduate	282	72.9
Employment Status	House wife/not working	70	18.1
	Governmental employee	217	56.1
	Private sector employee	36	9.3
	Business/trading	7	1.8
	Retired	23	5.9
	Others	34	8.8
Family income (Saudi Riyals/month) (n=369)	<3000	69	18.7
	3000-<11000	88	23.8
	11000-<16000	96	26.0
	>16000	116	31.5

Perception towards Monkeypox disease

More than half (55.6%) of the participants believed that monkeypox will affect social and economic life like the COVID-19 pandemic while 30.7% considered Monkeypox as a conspiracy or bioterrorism [Table 2].

Knowledge about Monkeypox disease

Majority of the participants could recognize that Monkeypox affects both males and females (92%), monkeypox can be transmitted between humans (91%), skin rash is a symptom of monkeypox (89.4%), there are few cases recorded in Saudi Arabia (87.3%) and Monkeypox is a contagious viral disease while less than half of them knew correctly that Monkeypox is not a new infection that appeared in the year 2022 (38.8%) and there is a monkeypox vaccine available in Saudi Arabia (37%) [Table 3].

Overall, almost half (50.4%) of the participants expressed excellent level of knowledge, whereas only 4.4% had poor level of knowledge [Figure 1].

The highest level of excellent knowledge about Monkeypox disease was observed among participants in the age group 26–45 years (55.1%), whereas the lowest was observed among those in the age group 46–60 years (39.7%), $P = 0.001$. More educated participants (university/postgraduates) were more knowledgeable about Monkeypox disease as 53.5% of them had excellent level of knowledge compared to 33.3% of those below secondary school educational level, $P = 0.047$. Other factors (gender, residence, nationality, marital status, employment status and family income) were not significantly associated with the level of knowledge about Monkeypox [Table 4].

Discussion

Assessment of awareness and knowledge of the general population regarding Monkeypox is rarely investigated on a global level with only one recent Saudi study.[14] The World Health Organization (WHO) reported a lack of knowledge about monkeypox as one of the main challenges facing authorities in implementing effective preventive strategies.[16]

In the present study, 50.4% of the adult population expressed excellent level of knowledge whereas only 4.4% had poor level of knowledge about monkeypox. This high level of knowledge could be partially explained by the high percentage of university/postgraduates people in our sample (72.9%) as this might result

from collection of our data through an online method as usually higher educated people are more responding to online surveys than less educated people. This could be one of the limitations of the present study. Defective knowledge was observed regarding that fact that Monkeypox is not a new infection that appeared in the year 2022 and the availability of a monkeypox vaccine in Saudi Arabia.

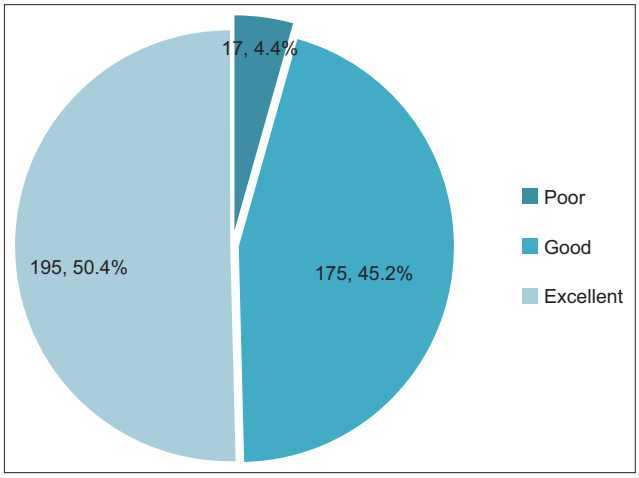

Figure 1: Overall level of knowledge about Monkeypox among the participants

Table 2: Perception towards Monkeypox disease

Questions	Categories	Frequency	Percentage
Do you believe monkeypox will affect social and economic life like the COVID-19 pandemic?	No	172	44.4
	Yes	215	55.6
In your opinion, is monkeypox a conspiracy or bioterrorism?	No	268	69.3
	Yes	119	30.7

In agreement with our finding, a similar recent online population-based study carried out in Saudi Arabia revealed that 48% of the participants had high knowledge.[14] Interestingly, a Saudi study carried out among medical students observed that most of students (72%) had poor knowledge about the Monkeypox disease.[17] Moreover, a study conducted among Saudi physicians showed that a considerable proportion of them had poor knowledge regarding the endemic nature of Monkeypox, its mode of transmission, its clinical variation from smallpox, chickenpox, and influenza and the therapeutic management and vaccination for the disease.[18] This could be due to using a different more detailed and scientific tool to assess the knowledge of medical students and physicians, which differ from the one used in this study. Therefore, comparison in this regard is not a practical issue. In the United Arab of Emirates (2022), the average knowledge score of university students was 70.1% (68.9 − 71.3%); about one-fifth (19.9%) had poor knowledge, 57.3% had moderate knowledge and 22.8% had good knowledge about Monkeypox.[2]

On an international level, different findings were reported. In Bangladesh (2022), almost two-thirds of the general populations were aware of Monkeypox; however, 66.6% had insufficient knowledge about the mode of transmission, vaccination, and the signs and symptoms of Monkeypox while the majority was

Table 3: Knowledge of the participants about Monkeypox

Questions	Correct answers		
	Response	No.	Percentage
What kind of disease does monkeypox cause?	Infectious disease	312	80.6
Monkeypox is a new infection that appeared this year 2022.	No	150	38.8
Monkeypox is a sexually transmitted disease.	Yes	235	60.7
Chickenpox and monkeypox are the same disease.	No	325	84.0
Monkeypox is common in Middle Eastern countries.	No	288	74.4
Monkeypox is common in West and Central African countries.	Yes	325	84.0
There are many cases recorded in Saudi Arabia.	No	338	87.3
Monkeypox cases are increasing in the USA and Europe.	Yes	266	68.7
Monkeypox is a contagious viral disease.	Yes	333	86.0
Monkeypox is a contagious bacterial disease.	No	268	69.3
Monkeypox is easily transmitted from one person to another.	Yes	286	73.9
Monkeypox is transmitted to humans through the bites and scratches from infected animals	Yes	276	71.3
People with monkeypox can transmit the disease to others (the disease is transmitted between humans).	Yes	352	91.0
Monkeypox is spread by droplets (coughing and sneezing).	Yes	242	62.5
The first symptoms of monkeypox are similar to the flu.	Yes	282	72.9
Skin rash is a symptom of monkeypox.	Yes	346	89.4
Monkeypox only affects males.	No	356	92.0
Hand sanitizers and face masks are important in preventing monkeypox.	Yes	315	81.4
There is a special treatment for monkeypox.	No	219	56.6
Monkeypox is spread through bodily fluids.	Yes	262	67.7
There is a monkeypox vaccine available in Saudi Arabia.	Yes	143	37.0
The chickenpox vaccine I got in childhood protects me from monkeypox.	No	232	59.9
There is a smallpox vaccine that can be used for monkeypox.	Yes	189	48.8

Table 4: Factors associated with participants' knowledge about Monkeypox disease

	Knowledge about Monkeypox			*P**
	Poor *n*=17 *n* (%)	Good *n*=175 *n* (%)	Excellent *n*=195 *n* (%)	
Gender				
Male (*n*=106)	6 (5.7)	43 (40.6)	57 (53.7)	0.457
Female (*n*=281)	11 (3.9)	132 (47.0)	138 (49.1)	
Age in years				
18-25 (*n*=50)	5 (10.0)	23 (46.0)	22 (44.0)	0.001
26-45 (*n*=247)	3 (1.2)	108 (43.7)	136 (55.1)	
46-60 (*n*=78)	9 (11.5)	38 (48.7)	31 (39.7)	
>60 (*n*=12)	0 (0.0)	6 (50.0)	6 (50.0)	
Residence				
Village (*n*=44)	4 (9.0)	20 (45.5)	20 (45.5)	0.255
City (*n*=343)	13 (3.8)	155 (45.2)	175 (51.0)	
Nationality				
Saudi (*n*=370)	17 (4.6)	164 (44.3)	189 (51.1)	0.215
Non-Saudi (*n*=17)	0 (0.0)	11 (64.7)	6 (35.3)	
Marital status				
Single (*n*=85)	5 (5.9)	39 (45.9)	41 (48.2)	0.912
Married (*n*=271)	12 (4.4)	122 (45.0)	137 (50.6)	
Divorced (*n*=25)	0 (0.0)	11 (44.0)	14 (56.0)	
Widowed (*n*=6)	0 (0.0)	3 (50.0)	3 (50.0)	
Educational level				
Below secondary school (*n*=21)	2 (9.5)	12 (57.2)	7 (33.3)	0.047
Secondary school/intermediate Diploma (*n*=84)	1 (1.2)	46 (54.8)	37 (44.0)	
University/postgraduate (*n*=282)	14 (5.0)	117 (41.5)	151 (53.5)	
Employment Status				
House wife/not working (*n*=70)	1 (1.4)	34 (48.6)	35 (50.0)	0.620
Governmental employee (*n*=217)	10 (4.6)	93 (42.9)	114 (52.5)	
Private sector employee (*n*=36)	1 (2.8)	15 (41.7)	20 (55.5)	
Business/trading (*n*=7)	0 (0.0)	5 (71.4)	2 (28.6)	
Retired (*n*=23)	2 (8.7)	11 (47.8)	10 (43.5)	
Others (*n*=34)	3 (8.8)	17 (50.0)	14 (41.2)	
Family income (Saudi Riyals/month) (*n*=369)	16	169	184	
<3000 (*n*=69)	1 (1.4)	35 (50.7)	33 (47.9)	0.121
3000-<11000 (*n*=88)	2 (2.3)	45 (51.1)	41 (46.6)	
11000-<16000 (*n*=96)	4 (4.2)	47 (49.0)	45 (46.8)	
>16000 (*n*=116)	9 (7.8)	42 (36.2)	65 (56.0)	

*Chi-square test

not knowledgeable regarding the treatment of Monkeypox.[19] In Nigeria (2022), awareness of Monkeypox among general adult population was high (89%) while good knowledge was observed among 58.7% of them and the defective knowledge was mainly reported concerning the incubation period of the disease, the main signs and symptoms, the mode of transmission and preventive strategies.[20] In Indonesia (2020), almost one-third of general practitioners (36.5%) had good knowledge about Monkeypox disease.[21]

In the current study, the only two factors significantly associated with excellent knowledge about Monkeypox were the age and educational level of the participants as the highest level of excellent knowledge was observed among participants in the age group 26–45 years, whereas older and younger participants expressed lower level of knowledge and also university/postgraduates were more knowledgeable about the disease compared to lower educated participants. Age and educational level were also significant predictors for knowledge about Monkeypox in another Saudi study; however, also in that study other predictors were identified such as marital status, living in the urban area, job status, being a healthcare worker, income and smoking status of the participants.[14] In Bangladesh, educational status and employment status were significantly associated with overall level of knowledge about Monkeypox among the general adult population.[19] In the United Arab of Emirates, older students, female gender, medical colleges` students, students having a history of human chickenpox infection and those receiving information on human Monkeypox during education were determinants of level of knowledge about Monkeypox disease.[2] In Nigeria, male gender, Philosophy Doctorate (PhD) level education and being homosexual were significant predictors for good knowledge of Monkeypox disease.[20] In Indonesia, physicians aged over 30 years were more likely to express lower knowledge score compared to younger physicians and those working in private clinics had lower knowledge score compared to those working in community health centers.[21] Comparison between the aforementioned studies, including ours should be interpreted in the light of differences in sociodemographic characteristics

of the participants in these studies as well as using different tools to assess knowledge about Monkeypox disease.

In the present study, more than half of the participants believed that monkeypox will affect social and economic life like the COVID-19 pandemic while 30.7% considered Monkeypox as a conspiracy or bioterrorism. In an another study conducted among medical students,[17] nearly half of the students believed that the Monkeypox disease could be transmitted to Saudi Arabia.

Some important limitations should be addressed concerning this study. First, the cross-sectional design adopted it, which only proves the association between exposure and outcomes and not causality as both were investigated simultaneously. Second, being an online study, it is subjected to selection bias. Third, we have included only general adult population from one city in Saudi Arabia; therefore, the generalizability of findings over other cities is not practical.

Conclusion and Recommendations

Overall, the knowledge of the general population in Jeddah, Saudi Arabia about Monkeypox is acceptable. However, defective knowledge was observed regarding the fact that Monkeypox is not a new infection that appeared in the year 2022 as well as about the availability of a monkeypox vaccine in Saudi Arabia. Participants in the age group 26–45 years and more educated participants (university/postgraduates) were more knowledgeable about the disease than their peers. A considerable proportion of the participants believed that monkeypox will affect social and economic life like the COVID-19 pandemic and Monkeypox is considered as a conspiracy or bioterrorism. Based on the study`s findings, it is recommended to organize educational activities at primary care level about the disease for general population targeted mainly lower educated and elderly subjects. In addition, the larger nationwide study should be conducted. Awareness of the general population about the availability of Monkeypox vaccine should be raised.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Center for Disease Control and Prevention (CDC). About Monkeypox. Available from: https://www.cdc.gov/poxvirus/Monkeypox/about/index.html. [Last accessed on 2022 Jul 22].
2. Jairoun AA, Al-Hemyari SS, Abdulla NM, El-Dahiyat F, Shahwan M, Hassan N, *et al.* Awareness and preparedness of human Monkeypox outbreak among university students: Time to worry or one to ignore? J Infect Public Health 2022;15:1065-71.
3. European Centre for Disease Prevention and Control (ECDC). Communicable Disease Threats Report. Available from: https://www.ecdc.europa.eu/sites/default/files/documents/communicable-disease-threats-report-23-july-2022-public.pdf. [Last accessed on 2022 Jul 19].
4. Damon IK. Status of human Monkeypox: Clinical disease, epidemiology and research. Vaccine 2011;29(Suppl 4):D54-9.
5. Parker S, Nuara A, Buller RML, Schultz DA. Human Monkeypox: An emerging zoonotic disease. Future Microbiol 2007;2:17-34.
6. Vaughan A, Aarons E, Astbury J, Brooks T, Chand M, Flegg P, *et al.* Human-to-human transmission of Monkeypox virus, United Kingdom, October 2018. Emerg Infect Dis 2020;26:782-5.
7. Bunge EM, Hoet B, Chen L, Lienert F, Weidenthaler H, Baer LR, *et al.* The changing epidemiology of human Monkeypox—A potential threat? A systematic review. PLoS Negl Trop Dis 2022;16:e0010141.
8. Al-Tammemi AB, Albakri R, Alabsi S. The outbreak of human Monkeypox in 2022: A changing epidemiology or an impending aftereffect of Smallpox eradication. Front Trop Dis 2022;3:951380.
9. Mbala PK, Huggins JW, Riu-Rovira T, Ahuka SM, Mulembakani P, Rimoin AW, *et al.* Maternal and fetal outcomes among pregnant women with human Monkeypox infection in the Democratic Republic of Congo. J Infect Dis 2017;216:824-8.
10. Rodriguez-Morales AJ, Lopardo G. Monkeypox: Another sexually transmitted infection? Pathogens 2022;11:713.
11. World Health Organization. Multi-Country Monkeypox Outbreak in NON-Endemic Countries. 2022. Available from: https://www.who.int/emergencies/disease-outbreak-news/item/2022-DON385. [Last accessed on 2022 Jul 14].
12. Rallapalli S, Razai MS, Majeed A, Drysdale SB. Diagnosis and management of Monkeypox in primary care. J R Soc Med 2022;115:384-9.
13. Wikipedia. Jeddah, Saudi Arabia. Available from: https://en.wikipedia.org/wiki/Jeddah. [Last accessed on 2022 Sep 21].
14. Alshahrani NZ, Alzahrani F, Alarifi AM, Algethami MR, Alhumam MN, Ayied HAM, *et al.* Assessment of knowledge of Monkeypox viral infection among the general population in Saudi Arabia. Pathogens 2022;11:904.
15. Centers for Disease Control and Prevention (CDC). Monkeypox. Available from: https://www.cdc.gov/poxvirus/Monkeypox/index.html. [Last accessed on 2022 Jul 11].
16. World Health Organization. Monkeypox-United Kingdom of Great Britain and Northern Ireland. Geneva, Switzerland: WHO; 2022. Available from: https://www.who.int/emergencies/disease-outbreak-news/item/2022-DON381.
17. Alshahrani NZ, Mitra S, Alkuwaiti AA, Alhumam MN, Altmimi SMB, Alamri MHM, *et al.* Medical students' perception regarding the re-emerging Monkeypox virus: An institution-based cross-sectional study from Saudi Arabia. Cureus 2022;14:e28060.
18. Alshahrani NZ, Algethami MR, Alarifi AM, Alzahrani F, Sheerah HA, AbdelaaI A, *et al.* Knowledge and attitude regarding Monkeypox virus among physicians in Saudi Arabia, A cross-sectional study. Res Sq 2022; preprint. doi: 10.21203/rs. 3.rs-1883068/v2.

19. Nath SD, Islam AMK, Majumder K, Rimti FH, Das J, Tabassum MN, *et al*. Assessment of knowledge on human Monkeypox virus among general population in Bangladesh: A nationwide cross-sectional study. MedRxiv (preprint2022).
20. Al-Mustapha AI, Sikiru NA, Kolawole B, Oyewo M, Ahmed H, Odukoya A. A cross-sectional survey of public knowledge of the Monkeypox disease in Nigeria. Res Sq 2022; preprint. doi: 10.21203/rs. 3.rs-2031058/v1.
21. Harapan H, Setiawan AM, Yufika A, Anwar S, Wahyuni S, Asrizal FW, *et al*. Knowledge of human Monkeypox viral infection among general practitioners: A cross-sectional study in Indonesia. Pathog Glob Health 2020;114:68-75.