



Healthcare Workers' Knowledge and their Confidence in the Diagnosis and Management of Human Monkey pox, A Cross-Sectional Study in District Health Authority Narowal, Pakistan

7 Muhammad Tariq¹8
9 ^{1*} District Health Officer Narowal; 03459573339; tariq13876@gmail.com10 **Abstract:** In recent times, the monkeypox epidemic has been a global threat but for
11 low-middle countries like Pakistan, the rise of Monkey-pox cases is a major public concern. The
12 health care workers are the front-line soldiers in any pandemic and epidemic situation. Their better
13 knowledge and early diagnosis are the best way to manage this epidemic.14 **Objective:** To investigate the healthcare workers' knowledge about the monkeypox virus and their
15 confidence in the diagnosis at the District Health Authority (DHA), Narowal. This study was
16 cross-sectional and was conducted in DHA Narowal.17 **Method:** The sample size was 114 from different categories of Health care workers like physicians,
18 pharmacists, nurses, and allied health workers. The data is collected through a self-developed
19 questionnaire consisting of 35 questions, having two sections: Knowledge and confidence in the
20 diagnosis. The data was analyzed through SPSS-26 and, chi-square, and multivariate regression
21 were applied to the data.22 **Results:** The average score for Knowledge was 5.82(2.01), and confidence for diagnosis was 6.32
23 (2.11) which indicated poor knowledge and confidence for diagnosis among healthcare workers.
24 Only 49% of healthcare workers knew that vaccines could cure the monkeypox. The associated
25 factor for poor knowledge is the younger age, having a low education degree, and training job in the
26 urban area, $p < 0.001$.27 **Conclusion:** The level of knowledge about the monkeypox virus and confidence in diagnosis is
28 low among the participants. It is necessary to conduct training for healthcare workers to increase
29 their knowledge regarding the monkeypox virus.30 **Keywords:** Monkey-pox, virus, knowledge, healthcare, workers, confidence, diagnosis

31

32 **1. Introduction**33 The discovery of a new outbreak caused by the human monkey pox virus (HMPXV) has
34 sparked global worries among public health officials notwithstanding the ongoing challenges
35 posed by the coronavirus disease (COVID-19) pandemic. In 1970, the Democratic Republic of the
36 Congo (DRC) recorded the first human case of monkey pox. The DRC saw an endemic outbreak of
37 the disease, and it quickly expanded to Central and West African countries. The importation of
38 infected exotic animals was linked to the first incidence outside of Africa, which was recorded in
39 2003 (Bates, Grijalva, & Health, 2022). In 1970, 1996–1997, 2003, and 2018, there were five large
40 outbreaks of MPXV. Most recently, in 2022, there was a multi-country outbreak that spread to over
41 50 non-endemic nations across various continents, resulting in over 6,000 cases. Most of these
42 epidemics have been linked to illnesses that first appeared in Africa. To quote the authors: (Luna et
43 al., 2022). In 2022, monkey pox spread all over the world. There were 68,428 confirmed cases of
44 monkey pox in the United States between January 1, 2022, and September 30, 2022, with 99 of
45 those locales being new to reporting such cases. The global outbreak of monkey pox was declared a
public health emergency of international concern by the World Health Organization (WHO) on
July 23, 2022 (WHO, 2022). The United States Centers for Disease Control and Prevention and
their European Union (EU) counterparts both identify healthcare workers (HCWs) as a population
at high risk for the spread of infectious diseases (Nuzzo, Borio, & Gostin, 2022).Infected animals can spread the disease to other animals either directly through their bodily
fluids, skin lesions, or respiratory droplets, or indirectly through contaminated fomites. Herd im-
munity to orthopox viruses is declining, and mathematical modeling shows that this poses a
growing hazard of human-to-human transmission of illness. Isolation in a negative pressure room,
together with standard, contact, and droplet precautions, followed by airborne precautions if fea-

Copyright: © 2023 by the authors.

This article is an open access publica-

tion under the terms and conditions of

the Creative Commons Attribution

(CC BY) license

[\(https://creativecommons.org/licenses](https://creativecommons.org/licenses/by/4.0/)

by/4.0/).

sible, are all measures recommended by the Centers for Disease Control and Prevention (CDC) (Moore, Rathish, & Zahra, 2022).

Infection with the pox virus begins at the site of injection, then it enters in to the body (oropharynx, nasopharynx, or intradermal). Then, the virus spreads from one organ to another after an initial viremia. This is the incubation time, which averages around 14 days but can go up to 21 days. Secondary viremia is associated with a delay of 1–2 days in the start of symptoms like fever and lymphadenopathy before lesions occur. Patients with infections may be infectious right now. (Hutson, et al., 2015)

The MPXV can be spread both directly through personal contact and indirectly through fomites. Transmission clusters among (gay and bisexual men included) have been noted, making the current HMPX outbreak one of a kind. This provides evidence that sexual contact may be an efficient means of virus dissemination (Català et al., 2022). The WHO has issued interim guidelines recommending swift implementation of infection, prevention, and control measures to aid in early diagnosis of the virus, particularly in high-risk regions. The MPV spreads in a manner analogous to that of the Ebola virus (EVD) and the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (CoviD-19). Transmission of MPV can occur by direct contact with the infectious rash, scabs, or body fluids, including respiratory secretions, or through contact with things (such as clothing or linens) that have previously come into contact with the infectious rash or body fluids. The MPV can be passed from mother to kid through the placenta. The monkeypox virus can also be transmitted to humans via animal scratching or biting, as well as through the consumption of diseased animals or the use of animal goods. (Delaney et al., 2022). The average duration of the disease is between two weeks. Those who have not developed signs of Monkeypox are incapable of spreading it to others. Additional studies are being undertaken at this moment to rule out the possibility of Monkeypox transmission via sperm or vaginal secretions (Tsagkaris, Matiashova, Essar, Atanasov, & Head, 2023) came to this conclusion. The prodromal stage of MPX illness, which includes fever, malaise, headache, and lymphadenopathy and distinguishes it from smallpox, begins 7–17 days into the incubation period. The maculopapular rash that typically appears on the face, head, and neck during the early stage of the disease appears after a prodromal period that lasts anywhere from one to four days. Within 14–21 days, the rash goes through a centrifugal transformation, changing from papular to vesicular to pustular to crusty (Sah et al., 2022). Initial recognition and widespread suppression are subject to the surveillance and recognition of MPX cases. Precise verdicts can be tough, specifically in areas where smallpox has been exterminated, owing to the issue of clinical resemblances to extra rash-causing ailments. To convincingly create MPXV occurrences, a laboratory test is compulsory. This can be done using methods like virus seclusion or PCR (polymerase chain reaction)(Saxena et al., 2023) Precise judgment and effective surveillance are important for the ailment's suppression and anticipation as the ailment has medical signs that are analogous to a persons of smallpox, chickenpox, and influenza. HCWs are critical in the documentation, reportage, and supervision of cases of MPXV; consequently, they must have optimum procedural know-how linked to MPXV surveillance(Alakunle, Moens, Nchinda, & Okeke, 2020)

Given the universal emergency of MPOX occurrence, primary preclusion, appropriate finding, and rapid retort and supervision from HCWs in Lebanon will be tremendously important. Though MPOX described cases in Lebanon remained only 24 as of 16 December 2022, HCWS must be well-informed and equipped for surveillance, analysis, and supervision of the ailment. Lebanon is transitory over spartan financial disaster and its medicinal segment is harassed with deficiencies in medication and medical apparatus, which might increase the position of smearing the suitable precautionary actions. In addition, the valuation of the relation among ailment knowledge and confidence can have optimistic insinuations on the empathetic of health-seeking comportment and obeying to deterrent events, particularly in states with a vulnerable health care organization.(Malaeb et al., 2023)

There have been no reported cases of monkeypox in Pakistan till May 29, 2022. While the provincial health service has issued a high alert and airport limitations have been put in place to prevent an outbreak, the lack of diagnostic facilities to detect the virus is concerning and needs to be addressed immediately. WHO recommends using a standard real-time polymerase chain reaction (PCR) for definitive diagnosis of suspected MPXV patients. Most of Pakistan's top research facilities have PCR machines but not the necessary testing supplies. The Pakistani government must immediately acquire the necessary testing kits, primers, and reagents to battle a potential viral outbreak, as identifying patients based on symptoms is not a viable strategy (Surgery, Huda, & Najeeb, 2020).

2. Materials and Methods

The research design of this study was a cross-sectional research design in which the sample included Health care workers (n=114) who were selected through convenience and purposive sampling from the district Health authority Narowal. The sample was further divided into four categories, physicians, nurses, pharmacists, and Allied health workers, the age range of the sample was 18 years and above.

2.1. Survey instrument

The data was collected through a self-developed questionnaire. This questionnaire consisted of three sections. The first section consisted of demographic variables, gender, educational level, socio-economic status, belonging to rural and urban areas, and occupational categories (Physician, Nurses, pharmacists, and Allied Health workers). the second section consisted of questions regarding knowledge about monkeypox virus and 3rd section was all about the diagnosis of monkeypox virus. Approval was taken from the chief executive officer District Health Authority Narowal, and after the approval informed consent was taken from all the participants, after briefing them about the purpose and importance of the research. Questionnaires were given to fill them. In the end, all participants were thanked by the researcher who ensure all the participants about their confidentiality. The dichotomous methods was used. The HCW having 60% or above score considered as adequate knowledge and the HCWs have 60% or above score of confidence was considered good confidence, the data was analyzed through SPSS-26. Participants' variables were expressed by using descriptive analysis. Chi-square was used to compare the knowledge and confidence for diagnosis with respect to occupational categories. Regression analysis was used to predict and associate the related factor with the knowledge and confidence of diagnosis among healthcare workers.

3. Results

The total number of study respondents that comprised the final sample was 114 Health care Workers. The general characteristics of the study respondents are illustrated in Table 1. Healthcare workers prevailed in the study sample, while males are more as compared to females. Most of the Health care workers ages are less than 30. The sample consisted of nurses (44.73%), physicians (23.68%), pharmacists (14.91%), and Allied Health workers (16.66%). Most of the participants belonged to the urban area (76.31%). Based on Pay, most of the participants have paid higher than 150K (69.2%). Most of the participants (54.38%) have a service length lower than 20 years.

Table 1: Characteristics of the Sample population (N=114)

Variables	Group	Number(frequency)	Percentage
Age	<30	62	54.38
	>30	52	45.62
Gender	Male	63	55.26
	Female	51	44.74
Profession	Nurse	51	44.73
	Physician	27	23.68
	Pharmacist	17	14.91
	Allied health workers	19	16.66
Residence	Urban	87	76.31
	Rular	27	23.68
Pay	<150,000	79	69.2
	>150,000	35	30.70
Year of service	<20 years	62	54.38
	>20 years	52	45.61

The total number of study respondents that comprised the final sample was 114. The general characteristics of the study respondents are illustrated in Table 1. Healthcare workers prevailed in the study sample, while males are more as compared to females. Most of the Health care workers ages are less than 30. The sample consisted of nurses (44.73%), physicians (23.68%), pharmacists (14.91%), and Allied Health workers (16.66%). Most of the participants belonged to the urban area

154 (76.31%). Based on Pay, most of the participants have paid higher than 150K (69.2%). Most of the
 155 participants (54.38%) have a service length lower than 20 years.

156 **Table 2: Knowledge about monkeypox in diagnosis among healthcare workers (n=114)**

Questions	Knowledge (n=114)	
	Correct	Incorrect
Have you ever heard about Monkeypox?	72(63%)	42(37%)
Monkeypox is endemic in certain parts of Central and West Africa, including the Democratic Republic of Congo, Cameroon, Nigeria, and the Central African Republic. Is this true?	53(46%)	61(54%)
Has monkeypox ever been reported in your country?	51(44%)	63(56%)
Do you know which country or region monkeypox is believed to have originated from?	49(43%)	65(57%)
Are you familiar with the primary animal host or reservoir for monkeypox?	53(46%)	61(54%)
Are you aware of any ongoing efforts to control the spread of monkeypox in your local area or region?	45(39%)	69(61%)
Do you think that people living in rural areas may be more susceptible to contracting monkeypox due to factors such as exposure to animals or poor sanitation?	52(46%)	62(54%)
Have you seen any evidence of a correlation between monkeypox and occupation, such as farmers or hunters who may have more frequent exposure to animals?	51(44%)	63(56%)
Rashes are a prime symptom of monkeypox. Rashes and pustules first appear on the face and gradually cover all the body parts including palms and soles	52(46%)	62(54%)
The cases of monkey-pox in humans is present?	51(44%)	63(56%)
Monkeypox is a viral disease?	49(43%)	65(57%)
Monkeypox is a bacterial disease.	53(46%)	61(54%)
Monkeypox can be transmitted from one human to another human.	51(44%)	63(56%)
Do monkey-pox and chicken-pox have similar symptoms?	56(49%)	57(51%)
In humans, is the sign of monkeypox flu-like symptoms?	50(44%)	64(56%)
Are antibiotics required in the management of human monkey-pox patients?	43(38%)	71(68%)
The vaccine for Monkey-pox is available?	49(43%)	65(57%)
Treatment of monkey-pox is available?	54(47%)	60(53%)

157 Table 2 describes the knowledge of the health care workers regarding the percentage of cor-
 158 rectness and incorrectness of the questions.

159 **Table 3: Confidence in diagnosis about monkeypox among healthcare workers (n=114)**

Confidence in Doctors	Yes	No
	Do you believe that improved surveillance and early detection efforts could help to prevent or control future monkeypox outbreaks?	54(47%)
Have you noticed any disparities in access to healthcare services between urban and rural populations with respect to monkeypox treatment?	53(46%)	61(54%)
Do you think that socioeconomic factors such as poverty or limited access to healthcare may impact the spread of monkeypox in certain populations?	54(47%)	60(53%)
Transmission of Monkeypox infection can be prevented by avoiding body contact and through washing hands regularly with antiseptics and sanitizer	54(47%)	60(53%)
Can monkeypox be prevented through a vaccine?	52(46%)	62(54%)
Can monkeypox be treated at home?	54(47%)	60(53%)
Can Monkey Pox be treated with antibiotics?	43(38%)	71(62%)
Is there a specific antiviral medication available for the treatment of monkeypox?	45(39%)	69(61%)
Do you know how much time patients take typically to recover from monkeypox?	54(47%)	60(53%)
What is the incubation period of this disease?	52(46%)	62(54%)
Patients of Monkeypox infection should be immediately isolated to avoid the transfer of infection to other people for 10-14 days.	56(49%)	58(51%)
Individuals with weakened immune systems, such as those living with HIV/AIDS, or those who have received organ transplants, may be more susceptible to severe	43(38%)	71(57%)

illness from monkeypox.		
The virus can also be spread from person to person through respiratory droplets, close contact, or contact with contaminated materials.	54(47%)	60(53%)
Have you ever received training on how to properly handle and dispose of materials contaminated with the monkeypox virus?	51(44%)	63(56%)
Can monkeypox cause severe illness, severe pneumonia, (inflammation of the brain), or death?	51(44%)	63(56%)

160 Table 3 describes the confidence of the health care workers regarding the percentage of cor-
 161 rectness and incorrectness of the questions.

162 **Table 4: Percentages of Knowledge about monkey-pox with respect to the occupation (n=114)**

Questions	Occupation (N=114)			
	Physician (n=27)	Nurses (n=51)	Pharmacist (17)	Allied health workers (19)
Have you ever heard about Monkeypox?	45%	39%	32%	30%
Monkeypox is endemic in certain parts of Central and West Africa, including the Democratic Republic of Congo, Cameroon, Nigeria, and the Central African Republic. Is this true?	51%	49%	42%	39%
Has monkeypox ever been reported in your country?	45%	40%	38%	34%
Do you know which country or region monkeypox is believed to have originated from?	50%	44%	40%	36%
Are you familiar with the primary animal host or reservoir for monkeypox?	51%	48%	43%	39%
Are you aware of any ongoing efforts to control the spread of monkeypox in your local area or region?	43%	40%	32%	30%
Do you think that people living in rural areas may be more susceptible to contracting monkeypox due to factors such as exposure to animals or poor sanitation?	54%	52%	48%	41%
Have you seen any evidence of a correlation between monkeypox and occupation, such as farmers or hunters who may have more frequent exposure to animals?	52%	47%	43%	41%
Rashes are a prime symptom of monkeypox. Rashes and pustules first appear on the face and gradually cover all the body parts including palms and soles	52%	49%	47%	43%
The cases of monkey-pox in humans is present?	47%	45%	41%	41%
Monkeypox is a viral disease?	51%	50%	43%	40%
Monkeypox is a bacterial disease.	49%	48%	43%	39%
Monkeypox can be transmitted from one human to another human.	52%	51%	49%	48%
Do monkey-pox and chicken-pox have similar symptoms?	49%	43%	41%	39%
In humans, is the sign of monkeypox flu-like symptoms?	53%	49%	48%	42%
Are antibiotics required in the management of human monkey-pox patients?	56%	53%	51%	48%
The vaccine for Monkey-pox is available?	53%	49%	43%	41%
Treatment of monkey-pox is available?	51%	48%	46%	42%

163

164

165

166 **Table 5: Characteristic of the subject according to Knowledge and confidence in diagnosis (N=114)**

Characteristic	Categories	Knowledge Score	P value	Confidence in Doctor	P value
All respondents		6.72(1.54)	0.01	5.32(1.63)	0.01
Gender	Male	6.32(1.32)	0.02	5.32(1.25)	0.03
	Female	5.21(1.97)	0.01	5.15(1.74)	0.01
Age	<30	5.54(1.51)	0.01	5.23(1.32)	0.01
	31-	5.35(1.62)	0.02	5.12(1.52)	0.02
	>30	5.58(1.68)	0.02	5.01(1.73)	0.02
Occupation	Allied health workers	4.97(1.88)	0.03	5.23(1.22)	0.01
	Pharmacist	5.45(1.97)	0.01	5.98(1.75)	0.03
	Nurses	5.51 (1.99)	0.01	5.99 (1.76)	0.02
	Physician	5.85(2.01)	0.03	6.32(2.11)	0.01
Pay	>150,000	6.13(1.64)	0.01	5.44(1.34)	0.01
	<150,000	5.32(1.92)	0.01	4.87(1.77)	0.02
Location	Rural	5.32(1.21)	0.02	5.11(1.22)	0.01
	Urban	6.43(1.09)	0.02	5.87(1.01)	0.00

167
168
169
170
171

The average score for Knowledge was 5.82(2.01), and for confidence in diagnosis was 6.32 (2.11) the younger participants, who have a high educational degree, physician and nurses by job, and lived in the urban area were more likely to have a high score on knowledge and confidence in diagnosis.

172 **Table 6: The factor associated with Knowledge and confidence by multivariable regression analysis (N=114).**

Characteristic		Knowledge of doctor OR 95% CI	Confidence of doctors OR 95% CI
Gender	Male	6.32(1.32)	1.32(0.53-1.02)
Age	<30	0.85(0.63-1.13)	1.23(0.01-1.42)
	31-	1.31(1.11-1.68)	1.22(0.98-1.88)
Profession	Nurses	1.65(1.22-2.32)	1.54(1.25-2.11)
	Physician	5.85(2.01)	6.32(2.11)
Pay	>150,000	1.22(0.97-1.87)	1.54(0.82-1.92)
Location	Urban	1.06(0.02-0.19)	0.54(0.33-0.76)

173
174
175
176
177
178

Note: OR= Odd ratio, CI= Confidence Interval, p<0.05

Table 6 represents the results of the multivariate logistic regression analysis. The dependent variables were knowledge and confidence in the doctor. The relevant factor for good knowledge and confidence in doctors was the male gender, younger age, profession type, high pay, and the urban area of living p<0.05.

179
180
181
182
183
184
185
186
187
188
189

4. Discussion

It is very important that to better combat Monkeypox, the Health care team's response should be prompt and effective. So, the objective of this study was to investigate the knowledge of the healthcare worker about monkeypox. It is very important to know the baseline knowledge and training of the health care workers. As WHO indicated, no doubt Health care workers are playing a central role in meditating and controlling monkeypox but amid the ongoing monkeypox outbreak, Healthcare workers are susceptible to disease acquisition and virus transmission. Therefore, evaluating their knowledge of the disease and their confidence in their ability to diagnose and treat potential cases is of the utmost importance. The knowledge deficiencies can then be addressed through appropriate education and trainings. In addition, providing the correct knowledge and training can improve the quality of care among HCWs, which is a crucial objective for safe and

190 high-quality patient service (WHO, 2022). In Pakistan, there is a dearth of research that investi-
191 gated the knowledge level of healthcare workers about monkeypox, so the objective of this study
192 was to know the knowledge about monkeypox among Pakistani healthcare workers.

193 The overall knowledge about monkeypox among Pakistani healthcare workers is low that is
194 62% (n=114). The study also revealed that social health care workers even do not fully know
195 about the primary reservoir animal and host of monkeypox. The result was strongly evident in the
196 study conducted in Saudi Arabia where only 50% of the healthcare workers know Monkey Pox
197 (Alshahrani et al., 2022).

198 The findings of this study are worrisome in this context. The majority of the doctors we polled
199 knew little to nothing about monkeypox, including its endemicity, transmission, clinical differ-
200 ences from smallpox, chickenpox, and influenza, clinical evolution (e.g., skin lesion evolution),
201 and the primarily related findings. When it comes to the therapeutic management of disease and
202 immunization, there is also a significant knowledge gap. Our results found with those of research
203 conducted in Indonesia (Ricco et al., 2022) and Italy (Harapan, 2020). Another study found that
204 less than 20% of GPs had heard of HMPX throughout their medical training, highlighting the
205 paucity of HMPX content in medical curricula (Harapan, 2020). A study found comparable low
206 levels of knowledge among Italian physicians about monkeypox (Ricco et al., 2022. In Saudi
207 Arabia (Alshahrani et al., 2022), Lebanon (Yousef et al., 2022), and the Kurdistan region of Iraq
208 (Ahmad et al., 2022), the general public was also found to have a limited understanding of Monkey
209 Pox.

210 According to the result, different factors are associated with low knowledge and confidence in
211 diagnosis. Health care workers of younger age, female gender, pharmacist, Allied health workers,
212 and health care workers belonging to rural areas had less knowledge. The possible explanation for
213 the low knowledge is that Pakistan now a day are suffering from political and economic instability
214 and there are very less ongoing training and coaching session to enhance the knowledge of
215 healthcare workers. The study also highlighted that a low level of knowledge about monkeypox in
216 Pakistan was also associated with lower confidence in the doctor's competence and the result are
217 similar to previous research conducted in Saudi Arabia (Tammemi, Albakri, & Alabsi, 2022). This
218 results in a reduction of content in medical and other healthcare-related curricula (Harapan et al.,
219 2022). Moreover, as monkeypox cases are very low in Pakistan, and their transmission from human
220 to human is limited the attention toward this from the Government agencies is very low, this factor
221 is also responsible for the low knowledge. In addition, before the current outbreak, monkeypox
222 cases were uncommon, human-to-human transmission was limited, and the disease received little
223 attention outside of endemic countries (Bunge et al., 2022).

224 For the better management of the monkey-pox virus, improving knowledge and awareness
225 programs would be beneficial (Cordeiro et al., 2022). The result of this study was also supported by
226 the studies conducted among Italian physicians and Kuwaiti healthcare professionals that also re-
227 vealed knowledge gaps regarding MPXV transmission (Martínez et al., 2022).

228 In the present study, with respect to occupation, physicians and nurses have high knowledge
229 as compared to pharmacists and Allied healthcare workers. It is associated with low training and
230 education with respect to age. Younger-age healthcare workers do not have much knowledge and
231 training regarding epidemic situations. The result is also supported by previous research in the
232 context of general practitioners' confidence to manage monkeypox (Harapan et al., 2022).

233 This study was carried out in 2022 amongst health physicians in Punjab, Pakistan in which
234 there were 250 participants. Out of these 229 (91.6%) having the knowledge of Human Monkey
235 Pox Infection [HMPI] while 8.4% were not cognizant of HMPI. (Khalid, Ehsan, Khalid, Mahmood,
236 & College, 2022)

237 The results define the association between low knowledge and low confidence about the di-
238 agnosis of Monkeypox. These results are enough to spread the to transfer the message to concerned
239 health authorities to conduct or plan training sessions for healthcare workers. From this step,
240 healthcare workers can handle the monkey pox epidemic effectively. The regular conference also
241 produces awareness knowledge about monkeypox among healthcare workers and their confidence
242 in diagnosis will increase.

243 5. Conclusions

244 The finding of this study depicted that healthcare workers have low knowledge about mon-
245 keypox and have a low confidence level in doctors. It is very important to have the optimal level of
246 knowledge for the better management of monkeypox in the country. Last but not least, as this is a
247 relatively new disease outside of Africa, a study in various aspects is required, including treatment
248 and prevention, which includes the use of vaccinations against this virus. COVID-19 (Gutiérrez et
249 al., 2020) exemplifies the importance of developing national clinical guidelines. Since most cases
250 of monkeypox will develop without complications, evidence-based guidelines should be devel-
251 oped, implemented, and widely promoted among physicians in Saudi Arabia and other countries to

provide the best available clinical management. This is especially important given that a case fatality rate of up to 10% has been reported for monkeypox in Africa (Kalthan et al., 2016). The likelihood of complications and death from monkeypox can be greatly reduced with early diagnosis, risk factor identification, and timely care.

Supplementary Materials: can be downloaded at: <https://www.mdpi.com/article/10.3390/healthcare10091722/s1>. Supplementary (Consent form and questionnaire translated to English).

Author Contributions: No (Only on author)

Funding: “This research received no external funding”

Institutional Review Board Statement: “The study was conducted according to the guidelines of the Declaration of Helsinki, and approved by the chief executive office district health authority Narowal with reference No: 5389/CEO/DHA/Nwl dated 03/03/2023

Informed Consent Statement: “Informed consent was obtained from all subjects involved in the study.”

Data Availability Statement: The data presented in this study are available upon request from the corresponding author

Acknowledgments: In this section, you can acknowledge any support given which is not covered by the author contribution or funding sections. This may include administrative and technical support, or donations in kind (e.g., materials used for experiments).

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

References

- Ahmed, S. K., Salar Omar Abdulqadirb, Rukhsar Muhammad Omar, Safin Hassan Hussein, Ismail, H., Chandran, D., Sharma, A. K., Kuldeep Dhama, Zheno Kareem Ahmed, Essa, R. A., Araz Qadir Abdulla, & Khdir, A. A. (2022). Study of knowledge, attitude and anxiety in Kurdistan-region of Iraqi population during the monkeypox outbreak in 2022: An online cross-sectional study. *Research Square (Research Square)*, 2(1). <https://doi.org/10.21203/rs.3.rs-1961934/v2>
- Alakunle, E., Moens, U., Nchinda, G., & Okeke, M. I. J. V. (2020). Monkeypox virus in Nigeria: infection biology, epidemiology, and evolution. *J2(11)*, 1257.
- Alshahrani, N. Z., Algethami, M. R., Alarifi, A. M., Alzahrani, F., Alshehri, E. A., Alshehri, A. M., Sheerah, H. A., Abdelaal, A., Sah, R., & Rodriguez-Morales, A. J. (2022). Knowledge and Attitude Regarding Monkeypox Virus among Physicians in Saudi Arabia: A Cross-Sectional Study. *Vaccines*, 10(12), 2099. <https://doi.org/10.3390/vaccines10122099>
- Alshahrani, N. Z., Alzahrani, F., Alarifi, A. M., Algethami, M. R., Alhumam, M. N., Ayied, H. A. M., Awan, A. Z., Almutairi, A. F., Bamakhrama, S. A., Almushari, B. S., & Sah, R. (2022). Assessment of Knowledge of Monkeypox Viral Infection among the General Population in Saudi Arabia. *Pathogens*, 11(8), 904. <https://doi.org/10.3390/pathogens11080904>
- Al-Tammemi, A. B., Albakri, R., & Alabsi, S. (2022). The Outbreak of Human Monkeypox in 2022: A Changing Epidemiology or an Impending Aftereffect of Smallpox Eradication? *Frontiers in Tropical Diseases*, 3(1). <https://doi.org/10.3389/fitd.2022.951380>
- Bates, B. R., & Grijalva, M. J. (2022). Knowledge, attitudes, and practices towards monkeypox during the 2022 outbreak: An online cross-sectional survey among clinicians in Ohio, USA. *Journal of Infection and Public Health*, 15(12), 1459–1465. <https://doi.org/10.1016/j.jiph.2022.11.004>
- Català, A., Clavo Escribano, P., Riera, J., Martín-Ezquerria, G., Fernandez-Gonzalez, P., Revelles Peñas, L., Simón Gozalbo, A., Rodríguez-Cuadrado, F. J., Guilera Castells, V., De la Torre Gomar, F. J., Comunion Artieda, A., Fuertes de Vega, L., Blanco, J. L., Puig, S., García Miñarro, Á. M., Fiz Benito, E., Muñoz-Santos, C., Repiso-Jiménez, J. B., Ceballos-Rodríguez, C., & García Rodríguez, V. (2022). Monkeypox outbreak in Spain: clinical and epidemiological findings in a prospective cross-sectional study of 185 cases. *British Journal of Dermatology*, 2(1). <https://doi.org/10.1111/bjd.21790>
- Christos Tsagkaris, Matiashova, L., Mohammad Yasir Essar, Atanasov, A. G., & Head, M. G. (2022). No health issue stands alone in Eastern Europe: Monkeypox emergence amidst socioeconomic and political crises. *Journal of Medical Virology*, 95(1). <https://doi.org/10.1002/jmv.28305>
- Delaney, K. P. (2022). Strategies Adopted by Gay, Bisexual, and Other Men Who Have Sex with Men to Prevent Monkeypox virus Transmission — United States, August 2022. *MMWR. Morbidity and Mortality Weekly Report*, 71(1). <https://doi.org/10.15585/mmwr.mm7135e1>
- Fenollar, F., & Mediannikov, O. (2018). Emerging infectious diseases in Africa in the 21st century. *New Microbes and New Infections*, 26(1), S10–S18. <https://doi.org/10.1016/j.nmni.2018.09.004>
- Harapan, H., Setiawan, A. M., Yufika, A., Anwar, S., Wahyuni, S., Asrizal, F. W., Sufri, M. R., Putra, R. P., Wijayanti, N. P., Salwiyadi, S., Maulana, R., Khusna, A., Nusrina, I., Shidiq, M., Fitriani, D., Muharrir, M., Husna, C. A., Yusri, F., Maulana, R., & Andalas, M. (2020). Knowledge of human monkeypox viral infection among general practitioners: a cross-sectional study in Indonesia. *Pathogens and Global Health*, 114(2), 68–75. <https://doi.org/10.1080/20477724.2020.1743037>
- Harapan, H., Setiawan, A. M., Yufika, A., Anwar, S., Wahyuni, S., Asrizal, F. W., Sufri, M. R., Putra, R. P., Wijayanti, N. P., Salwiyadi, S., Maulana, R., Khusna, A., Nusrina, I., Shidiq, M., Fitriani, D., Muharrir, M., Husna, C. A., Yusri, F., Maulana, R., & Utomo, P. S. (2020). Confidence in managing human monkeypox cases in Asia: A cross-sectional survey among general practitioners in Indonesia. *Acta Tropica*, 206(1), 105450. <https://doi.org/10.1016/j.actatropica.2020.105450>
- Hutson, C. L., Carroll, D. S., Gallardo-Romero, N., Drew, C., Zaki, S. R., Nagy, T., Hughes, C., Olson, V. A., Sanders, J., Patel, N., Smith, S. K., Keckler, M. S., Karem, K., & Damon, I. K. (2015). Comparison of Monkeypox Virus Clade Kinetics and Pathology within the Prairie Dog Animal Model Using a Serial Sacrifice Study Design. *BioMed Research International*, 2015(1), 1–19. <https://doi.org/10.1155/2015/965710>
- Iñigo Martínez, J., Gil Montalbán, E., Jiménez Bueno, S., Martín Martínez, F., Nieto Juliá, A., Sánchez Díaz, J., García Marín, N., Córdoba De-orador, E., Nunziata Forte, A., Alonso García, M., Humanes Navarro, A. M., Montero Morales, L., Domínguez Rodríguez, M. J., Carbajo Ariza, M., Díaz García, L. M., Mata Pariente, N., Rumayor Zarzuelo, M., Velasco Rodríguez, M. J., Aragón Peña, A., & Rodríguez Baena, E.

- 315 (2022). Monkeypox outbreak predominantly affecting men who have sex with men, Madrid, Spain, 26 April to 16 June 2022. *Eurosurveillance*, 27(27). <https://doi.org/10.2807/1560-7917.es.2022.27.27.2200471>
- 316
- 317 Khalid, R., Ehsan, S., Khalid, A., Mahmood, K. J. J. o. A. F. M., & College, D. (2022). Knowledge of the Human Monkey Pox Infection among
318 Medical Practitioners in Punjab, Pakistan. 4(2).
- 319 Luna, N., Ramírez, A. L., Muñoz, M., Ballesteros, N., Patiño, L. H., Castañeda, S. A., Bonilla-Aldana, D. K., Paniz-Mondolfi, A., & Ramírez, J. D.
320 (2022). Phylogenomic analysis of the monkeypox virus (MPXV) 2022 outbreak: Emergence of a novel viral lineage? *Travel Medicine and*
321 *Infectious Disease*, 49(1), 102402. <https://doi.org/10.1016/j.tmaid.2022.102402>
- 322 Malaeb, D., Sallam, M., Salim, N. A., Dabbous, M., Younes, S., Nasrallah, Y., . . . Disease, I. (2023). Knowledge, attitude and conspiracy beliefs
323 of healthcare workers in Lebanon towards Monkeypox. 8(2), 81.
- 324 Najeeb, H., & Huda, Z. (2022). Monkeypox virus: A spreading threat for Pakistan? *Annals of Medicine and Surgery*, 1(2), 103977.
325 <https://doi.org/10.1016/j.amsu.2022.103977>
- 326 Nuzzo, J. B., Borio, L. L., & Gostin, L. O. (2022). The WHO Declaration of Monkeypox as a Global Public Health Emergency. *JAMA*, 328(7).
327 <https://doi.org/10.1001/jama.2022.12513>
- 328 Quinn, K. G., Kelly, J. A., DiFranceisco, W. J., Tarima, S. S., Petroll, A. E., Sanders, C., Lawrence, J. S. S., & Amirkhanian, Y. A. (2018). The
329 Health and Sociocultural Correlates of AIDS Genocidal Beliefs and Medical Mistrust Among African American MSM. *AIDS and Behavior*,
330 22(6), 1814–1825. <https://doi.org/10.1007/s10461-016-1657-6>
- 331 Riad, A., & Attia, S. (2022). Monkeypox-related oral manifestations and implications: Should dentists keep an eye out? *Journal of Medical Vi-*
332 *rology*, 2(1). <https://doi.org/10.1002/jmv.28091>
- 333 Riccò, M., Ferraro, P., Camisa, V., Satta, E., Zaniboni, A., Ranzieri, S., Baldassarre, A., Zaffina, S., & Marchesi, F. (2022). When a Neglected
334 Tropical Disease Goes Global: Knowledge, Attitudes and Practices of Italian Physicians towards Monkeypox, Preliminary Results. *Tropical*
335 *Medicine and Infectious Disease*, 7(7), 135. <https://doi.org/10.3390/tropicalmed7070135>
- 336 Riccò, M., Ferraro, P., Peruzzi, S., Balzarini, F., & Ranzieri, S. (2022). Mandate or Not Mandate: Knowledge, Attitudes, and Practices of Italian
337 Occupational Physicians towards SARS-CoV-2 Immunization at the Beginning of Vaccination Campaign. *Vaccines*, 9(8), 889.
338 <https://doi.org/10.3390/vaccines9080889>
- 339 Sah, R., Abdelaal, A., Asija, A., Basnyat, S., Sedhai, Y. R., Ghimire, S., Sah, S., Bonilla-Aldana, D. K., & Rodriguez-Morales, A. J. (2022).
340 Monkeypox virus containment: the application of ring vaccination and possible challenges. *Journal of Travel Medicine*, 3(1).
341 <https://doi.org/10.1093/jtm/taac085>
- 342 Sah, R., Padhi, B. K., Siddiq, A., Abdelaal, A., Reda, A., Ismail Lashin, B., Mohanty, A., Z. Alshahrani, N., & Rodriguez-Morales, A. J. (2022).
343 Public Health Emergency of International Concern declared by the World Health Organization for Monkeypox. *Global Security: Health,*
344 *Science and Policy*, 7(1), 51–56. <https://doi.org/10.1080/23779497.2022.2124185>
- 345 Sallam, M., Al-Mahzoum, K., Al-Tammemi, A. B., Alkurtas, M., Mirzaei, F., Kareem, N., Al-Naimat, H., Jardaneh, L., Al-Majali, L., AlHadidi,
346 A., Al-Salahat, K., Al-Ajlouni, E., AlHadidi, N. M., Bakri, F. G., Harapan, H., & Mahafzah, A. (2022). Assessing Healthcare Workers'
347 Knowledge and Their Confidence in the Diagnosis and Management of Human Monkeypox: A Cross-Sectional Study in a Middle Eastern
348 Country. *Healthcare*, 10(9), 1722. <https://doi.org/10.3390/healthcare10091722>
- 349 Saxena, S. K., Ansari, S., Maurya, V. K., Kumar, S., Jain, A., Paweska, J. T., . . . Abdel-Moneim, A. S. J. J. o. m. v. (2023). Re-emerging human
350 monkeypox: a major public-health debacle. 95(1), e27902.
- 351 Wang, C., Horby, P. W., Hayden, F. G., & Gao, G. F. (2020). A novel coronavirus outbreak of global health concern. *The Lancet*, 395(10223),
352 470–473. [https://doi.org/10.1016/s0140-6736\(20\)30185-9](https://doi.org/10.1016/s0140-6736(20)30185-9)
- 353 Youssef, D., Abboud, E., Malak Kawtharni, Zahraa Zheim, Nisrine Abou Arrage, & Youssef, J. (2022). When a neglected tropical zoonotic disease
354 emerges in non-endemic countries: Need to proactively fill the unveiled knowledge gaps towards human monkeypox among the Lebanese
355 population. 1, 1(2). <https://doi.org/10.21203/rs.3.rs-1998212/v1>
- 356