

# How Ready is Primary Care for Mpox (Monkeypox)? Mpox Knowledge Level Among Family Physicians: A Prospective Cross-sectional Study

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## ABSTRACT

**Introduction:** Mpox can cause serious complications and is a public health concern. Family physicians are the first healthcare professionals patients can apply for health. This study aimed to evaluate the level of knowledge of family physicians about mpox.

**Methods:** This prospective, descriptive, cross-sectional study was conducted. A survey was conducted between March 14, 2023 and April 14 of 2023 to evaluate the knowledge of mpox among 102 family physicians in Gaziantep, Turkey. The collected data were analyzed to determine physicians' knowledge of the disease, its symptoms, transmission, and treatment options.

**Results:** At the 80% cut-off, 8.8% of family physicians had good knowledge; at the 70% cut-off, 35.3% of physicians had good knowledge. The highest level of knowledge was observed in those working for 5 years or less; the lowest level was observed in those working for 6-15 years ( $p=0.045$ ). The most correct answer ( $n=98$ ) was "What is the type of microorganism that causes mpox?". The question with the most incorrect answers ( $n=90$ ) was "A definitive diagnosis is made using ELISA tests".

**Conclusion:** Family physicians are the first health professionals to access the virus, particularly in cases of community transmission. Identify areas where physicians need additional education and training to better diagnose and treat mpox.

**Keywords:** Mpox, monkeypox, family physician, knowledge, primary care

## Introduction

The mpox virus was first described in 1958. It was found in Macaca fascicularis, an Asian monkey used for polio immunization research at a laboratory in Denmark. Human mpox, a disease transmitted by the mpox virus, is therefore a zoonotic infection (1-3).

The first reported case of human mpox was in the Democratic Republic of Congo in 1970. It is most common in West and Central Africa. Since 2016, cases have been reported in the Central African Republic, Sierra Leone, Nigeria, and Liberia. In 2017, the largest outbreak of mpox was recorded in Nigeria, with 68 confirmed cases. It is recognized as an increasing public health threat, particularly in areas of West Africa where there is evidence of increased attack rates (3,4).

Human mpox cases have also been reported in the Americas, Europe, and Asia. The mpox virus was transmitted to the United States from prairie dogs imported from Africa. In the UK and Israel, patients were travelers returning from Nigeria. The first case of mpox in Asia was reported in

Singapore in 2019, when a Nigerian tourist was attending a conference. On June 30, 2022, Turkey reported the first confirmed case of Mpox virus detected by polymerase chain reaction (5-7).

Although smallpox was eradicated in 1980, mpox continues to occur in central and western African countries. Since May 2022, cases have also been reported in countries outside Africa with no previously documented mpox transmission (2,8).

Mpox has a high potential to be spread (9). Widespread transmission can lead to serious problems both in and outside the country (10). These can have social or economic consequences. Considering that the negative effects of the COVID-19 pandemic are still being overcome (11), the importance of this situation is clear. The increasing number of human cases of mpox highlights the value of prevention, timely recognition, and prompt intervention and treatment by healthcare workers. Unfortunately, a World Health Organization (WHO) report has shown that one of the barriers to preventing the disease is a lack of knowledge about mpox, especially by healthcare professionals (12).



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Although mpox has only been reported in Turkey in a few cases (13), healthcare workers should be informed and prepared for mpox cases. International tourism and trade in Turkey (14) may increase the vulnerability of populations to human mpox transmission. Family physicians are usually the first healthcare professionals patients consult for health (15). Therefore, in this study, we aimed to evaluate the level of knowledge of family physicians regarding mpox.

## Methods

### Study Design, Setting, and Survey

The study used a prospective, descriptive, cross-sectional design, which provided a brief insight into the physician knowledge levels. The collected data were analyzed to determine physicians' knowledge of the disease, its symptoms, transmission, and treatment options.

A survey was conducted between March 14, 2023, and April 14 of 2023 to evaluate the knowledge of mpox among family physicians in Gaziantep, Turkey. This self-administered questionnaire was designed for family physicians in Gaziantep. Personal (age, gender) and professional information (branch, duration of profession) questions were followed by mpox knowledge level questions (multiple choice, 37 questions). The knowledge questionnaire was designed in the Turkish language based on current facts from the centers for disease control and prevention and WHO (3,16).

Gaziantep University Faculty of Medicine Local ethics committee approval and provincial health directorate permission (approval number: 2022/254, date: 03.08.2022) were obtained.

The questionnaire took approximately 10 minutes to complete. Participants' names were not collected to ensure anonymity and confidentiality. At the end of the survey, raw data were extracted and analyzed using statistical software.

The inclusion criteria were those family physicians in Gaziantep province who voluntarily agreed to participate in the study and completed the questionnaire. The exclusion criterion was who left the survey incomplete.

### Statistical Analysis

The data were analyzed using SPSS 21.0 with a 95% confidence level. The level of knowledge was calculated, and the kurtosis and skewness coefficients were analyzed to determine the suitability of the level for normal distribution. The obtained kurtosis and skewness values were between +3 and 3, indicating that the data in the study were distributed normally (17-19). The highest and lowest scores for correct answers were calculated as percentages. Consequently, parametric test techniques were applied. The t-test and ANOVA were used to investigate differences in knowledge level based on demographic characteristics. The t-test was used to analyze demographic variables with 2 groups, while the ANOVA test was used to analyze variables in the k ( $k > 2$ ) groups. The association between categorical variables and willingness to receive training on Mpox disease was examined using the chi-squared test. Two cut-offs are used: 80% and a reduced cut-off of 70% to measure knowledge.

## Results

A total of 109 family physicians volunteered for the study. As 7 of them left the questionnaire incomplete, 102 were included in the analysis.

The mean and median knowledge scores were 0.53 and 0.57, respectively. The scores ranged from 0.05 to 0.92. When a cut-off of 80% was used, 9 out of 102 participants (8.8%) had good knowledge, whereas when the cutoff was reduced to 70%, 35.3% (36 out of 102) had good knowledge.

The age distribution of physicians was as follows: 31.4% were aged 30 years, 52% were between 31 and 40 years, and 16.7% were over 40. The mean age was  $35.41 \pm 8.77$  years. Approximately 53.9% were male and 46.1% were female. Approximately 76.5% of the patients were primary care practitioners and 23.5% were family medicine specialists.

40.2% of the physicians had been working for 5 years or less, 42.2% had been working for 6-15 years, and 17.6% had been working for more than 15 years. The mean professional experience of physicians was  $9.98 \pm 9.14$  years.

### Variables Related to Mpox Disease

Of these doctors, 95.1% ( $n=97$ ) had heard of mpox. Only 2.9% ( $n=3$ ) of the doctors were educated about mpox. Of the physicians surveyed, 87.9% ( $n=87$ ) said they would like to be educated about mpox.

The values of the information level ranged from a minimum of 0.05 to a maximum of 0.92. The average value of the information level was 0.53, and the standard deviation was 0.18. The skewness value was 0.608. The kurtosis value was 0.070.

Questions with correct answers:

What type of microorganism causes Mpox? ( $n=98$ ).

Initial symptoms include fever, severe headache, lymphadenopathy, back pain, myalgia, and severe fatigue ( $n=94$ ).

Mpox can be transmitted from humans to humans ( $n=92$ ).

Mpox does not infect children ( $n=85$ ).

Antibiotics are effective against Mpox ( $n=84$ ).

Questions with the most wrong answers:

A definitive diagnosis is made with ELISA tests ( $n=90$ ).

It is not necessary for the sample to have a culture medium in the tube ( $n=89$ ).

There is no vaccine available worldwide specifically for Mpox disease ( $n=86$ ).

More rash is expected on the trunk ( $n=85$ ).

Mpox disease can be transmitted from humans to humans through droplets ( $n=76$ ) (Table 1).

There was a statistically significant difference in knowledge level based on years spent in the profession ( $p=0.045$ ). The highest level of knowledge was observed in those working for 5 years or less, whereas the lowest level was observed in those working for 6-15 years. Age ( $p=0.138$ ), gender ( $p=0.577$ ), position, and willingness ( $p=0.736$ ) to

receive training on the Mpox did not exhibit a statistically significant difference in knowledge level (Table 2).

There is no statistically significant correlation between the willingness to be educated about mpox and age ( $p=0.462$ ), gender ( $p=0.200$ ), position ( $p=0.621$ ) or time in the profession ( $p=0.498$ ).

## Discussion

In this study, we found that family physicians had a high level of awareness (96.1%) regarding the causative agent of Mpox. Knowledge of the causative agent is of great importance for appropriate disease management and treatment strategies (20-22).

**Table 1. Mpox knowledge levels**

Question	Wrong answers, n (%)	Correct answers, n (%)	Mean $\pm$ SD of the correct answers
What type of microorganism causes Mpox?	4 (3.9%)	98 (96.1%)	0.96 $\pm$ 0.2
Mpox can be transmitted from animals to humans.	26 (25.5%)	76 (74.5%)	0.75 $\pm$ 0.44
Mpox can be transmitted from humans to humans.	10 (9.8%)	92 (90.2%)	0.9 $\pm$ 0.3
Which of the following symptoms is associated with Mpox?	33 (32.4%)	69 (67.6%)	0.68 $\pm$ 0.47
The initial symptoms include fever, severe headache, lymphadenopathy, back pain, myalgia, and intense fatigue.	8 (7.8%)	94 (92.2%)	0.92 $\pm$ 0.27
The symptoms are similar to those of smallpox but are milder.	50 (49%)	52 (51%)	0.51 $\pm$ 0.5
Mpox can be transmitted from humans to humans through droplets.	76 (74.5%)	26 (25.5%)	0.25 $\pm$ 0.44
Mpox can be transmitted from humans to humans through sexual contact.	59 (57.8%)	43 (42.2%)	0.42 $\pm$ 0.5
Mpox can be transmitted from humans to humans through blood transfusion.	65 (63.7%)	37 (36.3%)	0.36 $\pm$ 0.48
Mpox can be transmitted from humans to humans through direct contact with non-intact skin (wound contamination).	25 (24.5%)	77 (75.5%)	0.75 $\pm$ 0.43
Mpox can be transmitted from humans to humans through direct contact with intact skin.	68 (66.7%)	34 (33.3%)	0.33 $\pm$ 0.47
Mpox can be transmitted through secretion by the infected person.	34 (33.3%)	68 (66.7%)	0.67 $\pm$ 0.47
Transmission can occur by consuming the meat of infected animals (undercooked).	67 (65.7%)	35 (34.3%)	0.34 $\pm$ 0.48
Consuming other animal products from infected animals is a possible risk factor.	68 (66.7%)	34 (33.3%)	0.33 $\pm$ 0.47
Transmission of Mpox from animals to humans can occur through direct contact with infected animal blood, body fluids, or skin/mucous membrane lesions or through bites.	28 (27.5%)	74 (72.5%)	0.73 $\pm$ 0.45
Rash does not occur on the face.	56 (54.9%)	46 (45.1%)	0.45 $\pm$ 0.5
Rash can occur on the palms and soles.	33 (32.4%)	69 (67.6%)	0.68 $\pm$ 0.47
Rash does not occur in the genitals.	59 (57.8%)	43 (42.2%)	0.42 $\pm$ 0.5
More rash is expected on the trunk.	85 (83.3%)	17 (16.7%)	0.17 $\pm$ 0.37
Mpox does not cause infection in children.	17 (16.7%)	85 (83.3%)	0.83 $\pm$ 0.37
No vaccine is available worldwide specifically for Mpox disease.	86 (84.3%)	16 (15.7%)	0.16 $\pm$ 0.37
Mpox is not lethal.	42 (41.2%)	60 (58.8%)	0.59 $\pm$ 0.49
Antibiotics are effective against Mpox.	18 (17.6%)	84 (82.4%)	0.82 $\pm$ 0.38
Antivirals are effective against Mpox.	43 (42.2%)	59 (57.8%)	0.58 $\pm$ 0.5
Definitive diagnosis is made using PCR tests.	23 (22.5%)	79 (77.5%)	0.77 $\pm$ 0.42
Mpox is less contagious and causes less severe disease than smallpox.	43 (42.2%)	59 (57.8%)	0.58 $\pm$ 0.5
Vaccines against smallpox also protect against Mpox.	65 (63.7%)	37 (36.3%)	0.36 $\pm$ 0.48
The natural hosts are rodents such as mice, rats, and squirrels.	58 (56.9%)	44 (43.1%)	0.43 $\pm$ 0.5
The incubation period of Mpox from risky contact with the onset of symptoms, is usually 6-14 days.	41 (40.2%)	61 (59.8%)	0.6 $\pm$ 0.49
The incubation period can be extended up to 21 days.	45 (44.1%)	57 (55.9%)	0.56 $\pm$ 0.5
The rash usually starts within 1-3 days after the onset of fever.	41 (40.2%)	61 (59.8%)	0.6 $\pm$ 0.49
Sequence of rash development.	42 (41.2%)	60 (58.8%)	0.59
The most suitable diagnostic samples for mpox are skin lesions.	39 (38.2%)	63 (61.8%)	0.62 $\pm$ 0.49
The most suitable diagnostic samples for mpox are obtained from throat swabs.	62 (60.8%)	40 (39.2%)	0.39 $\pm$ 0.49
The most appropriate diagnostic samples for mpox are blood cultures.	71 (69.6%)	31 (30.4%)	0.3 $\pm$ 0.46
It is not necessary for the sample to have a culture medium in the tube.	89 (87.3%)	13 (12.7%)	0.13 $\pm$ 0.34
Definitive diagnosis is made using ELISA.	90 (88.2%)	12 (11.8%)	0.12 $\pm$ 0.32

PCR: Polymerase chain reaction, SD: Standard deviation

**Table 2. Investigation of knowledge level in terms of variables**

		Knowledge level	T, F	p
		Mean ± SD		
Age <sup>b</sup>	30 years and under	0.58±0.17	2.023	0.138
	31-40 years	0.51±0.18		
	Above 40 years	0.49±0.2		
Gender <sup>a</sup>	Male	0.52±0.19	-0.560	0.577
	Female	0.54±0.18		
Position <sup>a</sup>	Family physician	0.53±0.19	-0.283	0.778
	Family medicine specialist	0.54±0.14		
Time in profession (years) <sup>b</sup>	5 years and less	0.58±0.17	3.195	0.045*
	6-15 years	0.48±0.19		
	Over 15 years	0.53±0.16		
Would you like to be educated about Mpox? <sup>a</sup>	Yes	0.53±0.17	-0.339	0.736
	No	0.55±0.24		

\*: t test, <sup>b</sup>: ANOVA test, SD: Standard deviation

Alshahrani et al.'s (23) study in Saudi Arabia, which showed that the general level of knowledge about mpox among physicians was low, was similar to the results of the current study. These findings highlight the lack of knowledge about mpox among physicians and underscore the need for a better global understanding of the modes of transmission, diagnosis, and treatment of mpox.

Only 25% of the family physicians were aware of droplet transmission of mpox, indicating a significant training gap. Lack of knowledge may lead to inadequate isolation and infection control measures, which is of concern because of the potential for transmission by intradermal or respiratory routes (24-26).

The current study showed that most physicians accurately defined the incubation period of the mpox virus as ranging from 6 to 14 days, although fewer were aware that it could extend up to 21 days. This information is crucial for effective isolation protocols. In a study conducted by Gonzales-Zamora et al. (27) in Peru on the knowledge level of physicians regarding mpox, they were asked whether the incubation period was between 5 and 21 days, and most physicians provided the correct answer. The study conducted in Peru showed that although physicians had higher knowledge scores, they reported similar concerns regarding competence and preparedness. These findings indicate the need for more comprehensive education in this field.

The current study emphasizes that although palmar and plantar skin lesions are more commonly recognized, there is a lack of awareness regarding their symptomatology, particularly facial and genital lesions. In reviewing the literature, it was noted that other studies have asked questions about rash, but the difference in location of lesions was not questioned in detail (27-29).

This knowledge gap, which was also observed in a study conducted by Sahin et al. (29) for physicians in a university hospital in Turkey, points to the need for detailed training on the differential diagnosis of Mpox, not only in primary health care but also at all levels.

In the present study, only 2.9% of the physicians had received education on mpox. Other studies have also shown a small number of physicians educated on this subject, regardless of the results (19,23).

The study found that young physicians had a higher level of knowledge regarding mpox. This highlights the significance of ongoing education for medical professionals at all levels of experience. In addition, addressing challenges in effectively transferring knowledge is crucial. These challenges include the continuous growth of literature, the limited time, and difficulties in retaining information. Innovative methods, including the use of social media and multimedia tools, can play an important role in overcoming these barriers (30,31). The finding that recently graduated physicians had higher levels of knowledge about mpox may be a result of adapting their educational strategies to evolving communication methods, possibly due to their greater interaction with modern technological tools.

#### Study Limitations

This study has limitations. A major earthquake in Turkey on February 6, 2023 (32) also affected the province of Gaziantep and limited access to family physicians. The authors were uncertain about the sincerity of the doctors' responses due to the use of multiple-choice questions. However, this negative potential was eliminated by directly communicating the survey questions to the family physicians and obtaining their consent.

#### Conclusion

In conclusion, this study highlighted a moderate level of Mpox knowledge among family physicians, and similar findings from international studies underscore the need for a global educational intervention. These interventions should aim to update GPs' knowledge of mpox, focusing on areas such as transmission, symptomatology and diagnosis. To ensure effective management of emerging infectious diseases such as Mpox, comprehensive, continuous, and technologically adaptive educational efforts are essential.

**Ethics Committee Approval:** Gaziantep University Faculty of Medicine Local Ethics Committee approval and provincial health directorate permission (approval number: 2022/254, date: 03.08.2022) were obtained.

**Informed Consent:** It was obtained.

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