

# Knowledge Level, Attitudes and Practice Towards Mpox, and Willingness to Receive the Mpox Vaccine Among Family Physicians Working in Family Health Centers in Ankara Province

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## Keywords

Mpox • Knowledge • Attitude • Behavior • Family Physician • Vaccination

## Summary

**Introduction.** The increase in cases following the global mpox outbreak that began in May 2022 has highlighted the importance of early diagnosis, rapid response, and preventive measures in controlling the spread of the disease. The aim of our study was to determine the knowledge level, attitudes, and behaviors regarding mpox and the mpox vaccine among family physicians working at Family Health Centers in Ankara province.

**Materials and Methods.** This study is cross-sectional. The research was conducted between April 15, 2025, and July 15, 2025, using an online survey distributed via social media groups among primary care family physicians of the Ankara Provincial Health Directorate Public Health Services Department. The survey form consisted of a total of 49 questions: sociodemographic characteristics (14 questions), knowledge level regarding mpox (18 questions), attitude towards mpox (5 questions), willingness to use the mpox vaccine (5

questions), and Generalized Anxiety Disorder Scale (7 questions).

**Results.** A total 313 out of 1,741 family physicians participated in our study survey. The median age of family physicians was 36 (IQR: 30-47), 53.7% were female. Only 21.1% of family physicians had a good knowledge score about mpox. A statistically significant association was found between a good knowledge score about mpox and having previously heard of mpox and using research articles as a source of information about mpox ( $p = 0.004$ ,  $p = 0.036$ ).

**Conclusion.** Family physicians working at Family Health Centers in Ankara province had a low level of knowledge and low positive attitude towards mpox, and their rate of considering the smallpox vaccination for protection against mpox was a low. Therefore, it is recommended that awareness-raising and training programs be implemented for family physicians working in primary care regarding mpox.

## Introduction

Monkeypox (Mpox) is a viral zoonotic disease caused by the Monkeypox virus, an enveloped, double-stranded DNA virus belonging to the Orthopoxvirus genus of the Poxviridae family [1]. Monkeypox virus has two different types, clade I (clades Ia and Ib) and clade II (clades IIa and IIb) [1]. Currently, the increasing number of clade Ia and Ib cases in the Democratic Republic of Congo and other countries is a cause for concern [1].

Monkeypox virus was first identified in 1958 at the Copenhagen laboratory in Denmark [2]. The first human case was reported in a nine-month-old boy presenting with smallpox-like symptoms in the Democratic Republic of Congo in 1970 [3]. Following the eradication of smallpox and the end of smallpox vaccination worldwide in 1980, mpox cases have continued to occur regularly in Central and West African countries [1]. The first mpox cases outside of African countries were reported in the United States in 2003 [4]. In the Democratic Republic of Congo, thousands of mpox cases have been reported annually since 2005. In Nigeria, mpox re-emerged in

2017 and continued to spread among travelers within the country and internationally [1].

In 2022, mpox cases reported at least 116 countries worldwide. The World Health Organization (WHO) declared mpox a Public Health Emergency of International Concern (PHEIC) in July 2022. This designation was lifted in May 2023 following a decline in mpox cases from April 2023 onward [5]. The WHO declared a PHEIC for the second time in August 2024 due to a resurgence in mpox cases, and this declaration was subsequently ended on September 5, 2025, with the decline in case numbers [5]. Between January 1, 2022 and September 30, 2025, a total of 175,415 laboratory-confirmed of mpox cases and 467 deaths were reported from 142 countries [5]. A total of 71 laboratory-confirmed mpox cases were reported in Turkey between 2022 and 2025.

Mpox is transmitted from person to person through close contact with an infected individual [1]. Transmission from animals to humans also occurs through scratches and bites from infected animals or during activities such as hunting, skinning, trapping, and handling animal meat [1].

The incubation period for mpox, defined as the time from exposure to symptoms onset, is generally 6-14 days but may range from 1 to 21 days (1). The most common symptoms of mpox are fever, rash, sore throat, headache, muscle pain, back pain, and lymphadenopathy. The rash progresses through stages of macules, papules, vesicles, pustules, and crusts that eventually dry and slough off [1].

Mpox is a self-limiting illness with symptoms typically lasting 2-4 weeks. Complications of Mpox include bronchopneumonia, sepsis, encephalitis, corneal infection resulting in vision loss, and secondary bacterial infections [1]. Children, pregnant women and immunocompromised individuals are reported to have a higher risk of severe illness and death due to mpox complications [1].

Currently, two FDA approved antiviral drugs are available for the treatment of mpox, Tecovirimat and Brincidofovir [3]. Isolation and vaccination are essential measures for preventing from person to person transmission. Three vaccines (ACAM2000, LC16m8 and MVA-BN) have been approved by the WHO for use against mpox [6].

The recent increase in mpox cases has highlighted the importance of early diagnosis, rapid response, and preventive management in controlling the spread of the disease. Healthcare professionals play a vital role in this process. WHO assessment reported that insufficient knowledge about the disease, especially among healthcare workers, poses a significant challenge in controlling spread of mpox [7]. Healthcare workers, who serve on the front lines in preventing the spread of infectious diseases need to possess the necessary knowledge and understanding to educate the public about mpox vaccine acceptance, positive attitudes, and trust. Furthermore, healthcare workers play an important role in significantly reducing vaccine hesitancy in settings where vaccines are available, which WHO has identified as one of the major challenges in mass vaccination efforts [8, 9].

In the systematic review and meta-analysis conducted by Jahromi et al., the level of knowledge of mpox among healthcare workers was reported to be 26%, and their positive attitudes towards mpox were 34.6% (10). In a study conducted by Sahin et al., the rate of good knowledge about mpox among physicians was 32.5%, and 31.4% of physicians planned to receive the mpox vaccine [11]. In a study conducted by Harapan et al. reported that only 36.5% of general practitioners had a good level of knowledge about mpox. Furthermore, the level of knowledge about mpox was found to be lower among those who graduated from universities in Sumatra or other islands, those over 30 years of age, and general practitioners working in private clinics [7]. In another study by Hasan et al., it was reported that 30.5% of general practitioners had a good level of knowledge about mpox, and 15.1% had a positive attitude. Furthermore, acquiring information about mpox through the medical curriculum and obtaining information about mpox within the last month were significantly associated

with a good level of knowledge [11]. In this context, the aim of our study was to determine the knowledge level, attitudes, and behaviors regarding Mpox and the Mpox vaccine of family physicians working at Family Health Centers in Ankara province. It is anticipated that these findings will contribute to the planning of training programs on mpox and mpox vaccine, as well as the development of interventions to address the reasons for negative attitudes.

This study was presented at The National Vaccination and Immunization Congress 2025 (29 November-2 December 2025).

## Materials and Methods

This study employed a cross-sectional design. It was conducted using an online survey distributed to family physicians via social media groups (WhatsApp) between 15 April 2025 and 15 July 2025.

The study population consisted of 1741 family physicians working in Family Health Centers in Ankara province. The sample size was calculated as 281 family physicians using the OpenEpi 2013 Version 3.01 program, with a 95% confidence interval, a prevalence of 32.5% as reported by Sahin et al [11], and a deviation (d) of 0.05. After adding a 10% non-response rate, the required sample size was determined to be 309 family physicians. The study included family physicians working at Family Health Centers in Ankara province and those who voluntarily agreed to participate. Family physicians who refused to participate or did not approve the informed consent form were excluded from the study.

The data collection form was developed based on a review of the relevant literature [7, 10, 11]. The data collection form was distributed to family physicians via the Google Forms application through social media group (WhatsApp). Invitations to complete an anonymous online survey were distributed by social media (WhatsApp) and sent by e-mail to by the President of the Ankara Family Medicine Association (Ankara Family Medicine Association). Therefore, participants' phone numbers and email addresses were not collected. Before the data collection form was administered, family physicians were sent an 'Informed Consent Form' to obtain their consent for the study. The data collection form consisted of a total of 49 questions, including sociodemographic characteristics (14 questions), mpox knowledge level (18 questions), attitude toward mpox (5 questions), mpox vaccine willingness (5 questions), and Generalized Anxiety Disorder Scale (7 questions).

The first section of the data collection form consisted of 14 questions covering participants' sociodemographic and general information. The second section contained 18 questions assessing mpox knowledge level. The possible answers to each knowledge question were "yes," "no," and "I don't know." Mpox knowledge score are calculated by adding 1 to the total score for each correct answer, and adding 0 to the total score for each incorrect answer or "I don't know" answer. Accordingly, the total Mpox

knowledge level score was computed. Higher scores indicated a better level of knowledge. A cutoff of 70% (*i.e.* if a participant answered correctly 13 out of the total 18 questions) was used. The levels of knowledge were dichotomized into good and poor based on cutoff points (a 70% of the total score) [11]. Participants were asked about the likelihood of getting the smallpox vaccine to prevent monkeypox viral infection once made available. Responses were categorized as “willing” if the respondent selected agree and “unwilling” if they chose undecided or disagreed. The third section consisted of 5 questions regarding attitudes towards mpox, the fourth section consisted of 5 questions regarding willingness the mpox vaccine, and the fifth section consisted of 7 questions related to the Generalized Anxiety Disorder Scale.

Generalized Anxiety Disorder (GAD)-7 score is a validated, easy-to-administer, seven-item tool designed to measure generalized anxiety symptoms [12]. GAD-7 score assesses how frequently participants experienced each anxiety symptom in the past two weeks. GAD-7 score consists of seven-item, including inability to manage anxiety, restlessness, irritability, distress, worrying about many things, difficulty relaxing, and fear that something terrible might happen. Items are scored using a four-point scale ranging from “never=0” to “almost every day=3”, indicating the frequency of symptoms. GAD-7 scores were categorized into four severity groups; 0-4 (minimal anxiety), 5-9 (mild anxiety), 10-14 (moderate anxiety), and 15-21 (severe anxiety). Anxiety cases were identified with 82% specificity and 89% sensitivity using a cutoff value of 10 for the GAD-7 score [12].

A pilot study of data collection form was conducted with 10 randomly selected family physicians, and any erroneous or unclear questions were removed. The participants were selected from family physicians who were not involved in the study.

SPSS 21.0 package program was used to analyze the data. The suitability of normal distribution of numerical variables was evaluated by using the Kolmogorov Smirnov Test. In descriptive analyses, if continuous variables are normally distributed, mean±standard deviation is given, if they are not normally distributed, median and interquartile range (IQR) are given, and categorical variables are given as numbers or percentages. Pearson chi-square and Fisher’s exact test were used in the comparison of categorical variables in independent groups. Statistical significance level was taken as  $p < 0.05$ .

This study was approved by the Ankara Training and Research Hospital Scientific Research Ethics Committee (Date: 19.02.2025, Decision No: 425/2025). Permission was also obtained from the Ankara Provincial Health Directorate, Public Health Services Department, Primary Healthcare Services Research Requests Evaluation Committee (Date: 09.04.2025, No: 272812246). The study was conducted in accordance with the principles outlined in the Declaration of Helsinki and followed the Strengthening the Reporting of Observational Studies in Epidemiology Statement (STROBE) guidelines.

## Results

Our study included 313 of 1,741 family physicians working at Family Health Centers in Ankara province. The mean age of the participating family physicians was  $38.46 \pm 10.97$ , 53.7% were female, 46.3% were male. It was found that 34.2% of participating family physicians had received information about mpox during their medical training, and 79.9% had heard of mpox before (Tab. I).

Among the 313 family physicians, the questions that received the highest rates of correct responses regarding mpox knowledge were as follows: ‘Mpox is a viral infectious disease’ (90.1%), ‘Mpox affects both women and men’ (84.3%), and ‘Hand hygiene and mask use are important in preventing mpox’ (80.2%). Conversely, the questions with the lowest rates of correct responses regarding mpox knowledge were: ‘Mpox is more severe in adults than in children’ (10.5%), ‘Lymphadenopathy is the only clinical sign or finding used in the differential diagnosis of mpox and smallpox cases’ (21.1%), and ‘Mpox does not spread through droplets (coughing and sneezing)’ (22.0%) (Tab. II).

Of the 313 participating family physicians, 79.9% responded ‘I agree’ to the question, ‘I want to learn more about mpox.’ It was found that 69.6% respondent ‘I disagreed’ with the question, ‘I think that mpox will not add a new burden to the health systems of affected countries (Tab. III).

Regarding willingness to receive the mpox vaccine, 16.3% of participants agreed with the statement, ‘Mpox has decreased and I no longer need vaccination against mpox’, 18.2% agreed with the statement, ‘I am thinking of getting the smallpox vaccine to protect myself from mpox’ and 36.4% agreed with the statement, ‘I would be willing to get vaccinated against mpox if it were provided free of charge’ (Tab. IV).

The total score of GAD scale of the participating family physicians was found to be  $6.87 \pm 5.11$  (mean ± standard deviation). Based on the GAD scale score, 101 (32.3%) were classified as having minimal anxiety, 145 (46.3%) as having mild anxiety, 37 (11.8%) as having moderate anxiety, and 30 (9.6%) as having severe anxiety.

The mpox knowledge score of participating family physicians was calculated by adding 1 point to the total score for each correct answer to an 18-question, and 0 points for each incorrect answer or “I don’t know” answer. Accordingly, the mean knowledge score of the participating family physicians was determined as  $9.38 \pm 4.08$ , and the median knowledge score was 10 (IQR:8-12). A 70% correct answer rate was defined for both good and poor information levels. Mpox knowledge score of 313 participating family physicians was found to be good in 21.1% (66) and poor in 78.9% (247) (Tab. V).

No statistically significant relationship was found between the mpox knowledge level of participating family physicians and the mpox attitude questions.

Of the 313 participating family physicians, 21.2% of those with a good mpox knowledge level score answered “I agree” to the question “I am considering

**Tab. I.** Sociodemographic characteristics, vaccination status, and responses to questions about mpox of participating family physicians in the study (N=313).

Median (Interquartile Range)	n (%)
<b>Age, 36 (30-47)</b>	
30 ≤	55 (17,6)
31-39	48 (15,3)
40 ≥	210 (67,1)
<b>Gender</b>	
Female	168 (53,7)
Male	145 (46,3)
<b>Marital status</b>	
Married	223 (71,2)
Single	79 (25,3)
Widowed/Divorced	11 (3,5)
<b>Medical specialty</b>	
General practitioner	250 (79,9)
Family physician specialist	63 (20,1)
<b>Medical practice experience</b>	
Less than 1 year	40 (12,8)
1-5 years	54 (17,3)
5-10 years	69 (22,0)
10-20 years	74 (23,6)
More than 20 years	76 (24,3)
<b>Presence of a chronic illness</b>	
Yes	88 (28,1)
No	225 (71,9)
<b>History of having COVID-19</b>	
Yes	185 (59,1)
No	128 (40,9)
<b>COVID-19 vaccination status</b>	
Yes	300 (95,8)
No	13 (4,2)
<b>COVID-19 vaccine dosage</b>	
0 to 3 doses	146 (46,6)
4 or more doses	167 (53,4)
<b>Influenza vaccine status</b>	
Yes	180 (57,5)
No	133 (42,5)
<b>Receiving information about mpox during medical training</b>	
Yes	107 (34,2)
No	206 (65,8)
<b>Have you heard of mpox before?</b>	
Yes	50 (79,9)
No	63 (20,1)
<b>Presence of childhood smallpox vaccination</b>	
Yes	160 (51,1)
No	153 (48,9)
<b>Sources used to obtain information about mpox</b>	
Family or friends	
Yes	61 (19,5)
No	252 (80,5)
Social media	
Yes	109 (34,8)
No	204 (65,2)
TV and radio	
Yes	40 (12,8)
No	273 (87,2)
Books	
Yes	179 (57,2)
No	134 (42,8)
Research articles	
Yes	240 (76,7)
No	73 (23,3)

getting vaccinated against smallpox to protect myself from mpox,” while only 17.4% of those with a poor mpox knowledge level score answered “I agree”. Those with a good mpox knowledge level score were more likely to agree with the question, “I am considering getting vaccinated against smallpox to protect myself from mpox,” compared to those with a poor knowledge level score; however, the difference was not statistically significant ( $p=0.458$ ). It was found that 33.3% of those with a good mpox knowledge score answered “I disagree” to the statement “Mpox has decreased and I no longer need vaccination against mpox,” while 24.7% of those with a poor mpox knowledge score also answered “I disagree.”( $p=0.019$ ). Of the 313 family physicians participating in the study, 77.3% of those with a good mpox knowledge score agreed with the statement, “The recommendation of the mpox vaccine by doctors, the community, and other professionals has a great impact on me,” while only 57.1% of those with a poor mpox knowledge score agreed ( $p=0.004$ ) (Tab. VI).

When participating family physicians were asked, “I’m thinking of getting the smallpox vaccine to protect myself from mpox” Of those who had received the smallpox vaccine as a child, 50.9% responded “agree,” 45.7% responded “undecided,” and 62.7% responded “disagree,” while of those who did not have received the smallpox vaccine as a child, 49.1% responded “agree,” 54.3% responded “undecided,” and 62.7% responded “disagree”. Those who had received the smallpox vaccine as a child had a higher rate of agreeing responses to the question “I’m thinking of getting the smallpox vaccine to protect myself from mpox” compared to those who did not receive the smallpox vaccine, and the difference was statistically significant ( $p=0.039$ ) (Tab. VII).

## Discussion

Currently, mpox is not recognized as an international public health emergency. However, mpox cases continue to be reported in many countries [5]. Given that Turkey is a popular tourist destination, the level of knowledge and attitudes of physicians about mpox is crucial for developing a global strategy and combating mpox. In our study, family physicians answered approximately half of knowledge the questions correctly (above 50%), whereas questions concerning the existence of a smallpox vaccine and whether the disease could be prevented through post-exposure vaccination had correct response rates below 40%. Additionally, only 21.1% of family physicians had a good level of knowledge about mpox. Family physicians with a good level of knowledge about mpox were more likely to have heard of mpox before and to use research articles as a source information. The rate of positive responses to family physicians’ attitudes regarding mpox was below 40%, except of the question ‘I want to learn more about mpox’. In a systematic review and meta-analysis conducted by Jahromi et al., which included six studies involving 14,388 healthcare professionals, it was reported that 26% of healthcare

**Tab. II.** The distribution of responses to questions about mpox knowledge level of participating family physicians in the study (N=313).

	n (%)
<b>Mpox is a new infectious disease that emerged in 2022.</b>	
True	99 (31,6)
I don't know	88 (28,1)
False	126 (40,3)
<b>Mpox is a sexually transmitted disease.</b>	
True	104 (33,2)
I don't know	88 (28,1)
False	121 (38,7)
<b>Mpox is not transmitted to humans through bites or scratches from infected animals.</b>	
True	41 (13,1)
I don't know	110 (35,1)
False	162 (51,8)
<b>Mpox is transmitted from person to person through close contact.</b>	
True	227 (72,5)
I don't know	66 (21,1)
False	20 (6,4)
<b>Mpox is not spread through droplets (coughing and sneezing).</b>	
True	150 (47,9)
I don't know	94 (30,0)
False	69 (22,0)
<b>Mox is a disease that affects both women and men.</b>	
True	264 (84,3)
I don't know	46 (14,7)
False	3 (1,0)
<b>Hand hygiene and mask use are important in preventing mpox.</b>	
True	251 (80,2)
I don't know	53 (16,9)
False	9 (2,9)
<b>Mpox is a viral infectious disease.</b>	
True	282 (90,1)
I don't know	28 (8,9)
False	3 (1,0)
<b>Mpox is common in West and Central African countries.</b>	
True	245 (78,3)
I don't know	63 (20,1)
False	5 (1,6)
<b>Smallpox and mpox do not have similar symptoms and signs.</b>	
True	42 (13,4)
I don't know	69 (22,0)
False	202 (64,5)
<b>Skin papules and vesicles are not a symptom or sign of mpox.</b>	
True	19 (6,1)
I don't know	57 (18,2)
False	237 (75,7)
<b>Lymphadenopathy is the only clinical sign or finding used in the differential diagnosis of mpox and smallpox.</b>	
True	66 (21,1)
I don't know	158 (50,5)
False	89 (28,4)
<b>Mpox is more severe in adults than in children.</b>	
True	103 (32,9)
I don't know	177 (56,5)
False	33 (10,5)

<b>The fatality rate of mpox cases in the general population is 5-10%.</b>	
True	87 (27,8)
I don't know	208 (66,5)
False	18 (5,8)
<b>The chickenpox vaccine given in childhood provides protection against mpox.</b>	
True	110 (35,1)
I don't know	111 (35,5)
False	92 (29,4)
<b>There is a specific treatment for mpox.</b>	
True	26 (8,3)
I don't know	126 (40,3)
False	161 (51,4)
<b>There is a smallpox vaccine that can be used for mpox.</b>	
True	121 (38,7)
I don't know	155 (49,5)
False	37 (11,8)
<b>Vaccination after exposure to the mpox virus can help prevent the disease.</b>	
True	110(35,1)
I don't know	159(50,8)
False	44(14,1)

**Tab. III.** Distribution of responses to questions regarding the attitudes towards mpox of participating family physicians in the study (N=313).

	n (%)
<b>I am confident that mpox can be controlled in global population</b>	
Agree	128 (40,9)
Undecided	137 (43,8)
Disagree	48 (15,3)
<b>I want to learn more about mpox.</b>	
Agree	250 (79,9)
Undecided	46 (14,7)
Disagree	17 (5,4)
<b>I don't think it's dangerous to travel to countries where the mpox outbreak has occurred.</b>	
Agree	56(17,9)
Undecided	78(24,9)
Disagree	179(57,2)
<b>I don't think mpox will affect social and economic life.</b>	
Agree	48 (15,3)
Undecided	81 (25,9)
Disagree	184 (58,8)
<b>I think mpox cannot add a new burden to the health systems of affected countries.</b>	
Agree	35 (11,2)
Undecided	60 (19,2)
Disagree	218 (69,6)

during medical school or residency training, those who had previously been exposed to COVID-19 disease, and those who used research articles as a source of information were reported to be more likely to have knowledge of mpox [11]. In a study conducted by Alshahrani et al., it was found that the level of mpox knowledge in the general population was associated with age, marital status, place of residence, living in an urban area, education level, employment status,

**Tab. IV.** Distribution of responses questions about mpox vaccine willingness of participating family physicians (N=313).

	n (%)
<b>I'm thinking of getting the smallpox vaccine to protect myself from mpox.</b>	
Agree	57 (18,2)
Undecided	173 (55,3)
Disagree	83 (26,5)
<b>Mpox has decreased and I no longer need vaccination against mpox</b>	
Agree	51 (16,3)
Undecided	179 (57,2)
Disagree	83 (26,5)
<b>I am concerned about the potential side effects of the mpox vaccine.</b>	
Agree	86 (27,5)
Undecided	154 (49,2)
Disagree	73 (23,3)
<b>The fact that the mpox vaccine is recommended by doctors, the community, and other professionals has a great impact on me.</b>	
Agree	192 (61,3)
Undecided	100 (31,9)
Disagree	21 (6,7)
<b>I am willing to get vaccinated if the mpox vaccine is provided free of charge.</b>	
Agree	114 (36,4)
Undecided	164 (52,4)
Disagree	35 (11,2)

being a healthcare worker, income level and smoking status [14]. In contrast to these studies, our study found that the knowledge level of family physicians about mpox was associated only with whether they had heard of mpox before and whether they used research articles as a information source.

Vaccination currently represents the most effective means of preventing most vaccine-preventable diseases. In countries where mpox is endemic, challenges in prevention and treatment continue. Isolation and vaccination are the primary measures used to prevent from person to person transmission. Three vaccines have been approved by the WHO for use against mpox [16]. WHO and Center for Disease Prevention and Control recommend the use of JYNNEOS, ACAM2000 and LC16m8 vaccines for pre- and post-exposure prophylaxis in specific risk groups [17, 18]. In a systematic review and meta-analysis conducted by Ulloque-Badaracco et al., the prevalence of mpox vaccine acceptance was reported as 56% [19]. In another systematic review and meta-analysis conducted by Leon-Figueroa et al., the prevalence of intention to vaccinate against mpox was found to be 61% [20]. Studies have suggested that differences in the prevalence of intention vaccination are attributable to doubts about the efficacy and safety of the mpox vaccine and fears about unknown side effects [20, 21]. In a systematic review of 14 studies involving 10 696 participants conducted by Tanashat et al., reported that the willingness to receive the mpox vaccine was 65% [22]. In a study conducted by Sahin et al., reported that 31.4% of physicians plan to get the

mpox vaccine [11]. It was also found that those who learned about mpox during their medical training were more likely to receive the mpox vaccine when available. In contrast to these studies, The rate of considering getting the smallpox vaccine to protect themselves from mpox of family physicians was quite low (18.2%). Furthermore, those who did not consider getting the smallpox vaccine to protect against mpox had a higher rate of having received the smallpox vaccine as children. Nevertheless, the finding that 36.4% of family physicians expressed willingness to receive the mpox vaccine if it were provided free of charge and that 61.3% reported that recommendations from physicians, the community, and other professionals had a significant influence on their decision was encouraging with regard to future vaccination plans. Therefore, implementing training programs on the mpox vaccine for family physicians to enhance their knowledge level would contribute to increasing both knowledge and vaccination willingness in the broader community.

In a systematic review and meta-analysis by Mektebi et al., the acceptance rate of the Mpox vaccine among healthcare workers was reported as 58.5%, while the hesitancy rate was 41.5% [23]. Vaccine acceptance was 68% in countries in Asia and Africa, compared with 44.3% in countries in North America and Europe. The acceptance rate was 77.1% in studies conducted exclusively among physicians, compared with 49% in studies including all healthcare professionals [23]. Significant differences in mpox vaccine acceptance rates have been observed across different populations. Identifying the factors underlying these differences is crucial for developing interventions to increase vaccine acceptance. In our study, the rate of family physicians considering vaccination against smallpox to protect themselves from mpox was notably low. The reasons for this could not be investigated within the scope of our study; therefore, further multicenter studies are warranted.

In a meta-analysis conducted by Han et al., including 34 studies with 43,226 healthcare workers, they reported that 54% of healthcare workers were willing to be vaccinated against mpox and 40% had good knowledge about mpox [24]. The study also found that a history of smallpox vaccination did not significantly affect healthcare workers' willingness to receive another vaccine, whereas those who had been vaccinated against influenza or COVID-19 were more willing to receive the mpox vaccine. Studies have reported that willingness to be vaccinated against mpox is lower among low-income healthcare workers and higher among those with middle incomes. In our study, no correlation was found between family physicians' consideration of receiving the smallpox vaccine to protect against mpox and their influenza or COVID-19 vaccination status. Family physicians found no correlation between those considering getting the smallpox vaccine to protect against mpox and their vaccination status for influenza and COVID-19. However, it was found that those who received the smallpox vaccine as children were

**Tab. V.** Comparison of family physicians' knowledge level about mpox with sociodemographic characteristics, vaccination status, and questions about mpox.

	Poor Knowledge	Good Knowledge	<i>p</i>
	n (%)	n (%)	
<b>Age</b>			
30 ≤	44 (17,8)	11 (16,7)	0,973
31-39	38 (15,4)	10 (15,2)	
40 ≥	165 (66,8)	45 (68,2)	
<b>Gender</b>			
Female	127 (51,4)	41 (62,1)	0,121
Male	120 (48,6)	25 (37,9)	
<b>Marital status</b>			
Married	172 (69,6)	51 (77,3)	0,384
Single	65 (26,3)	14 (21,2)	
Widowed/Divorced	10 (4,0)	1 (1,5)	
<b>Medical specialty</b>			
General practitioner	199 (80,6)	51 (77,3)	0,553
Family physician	48 (19,4)	15 (22,7)	
<b>Medical practice experience</b>			
Less than 1 year	34 (13,8)	6 (9,1)	0,071
1-5 years	45 (18,2)	9 (13,6)	
5-10 years	49 (19,8)	20 (30,3)	
10-20 years	64 (25,9)	10 (15,2)	
More than 20 years	55 (22,3)	21 (31,8)	
<b>Presence of a chronic illness</b>			
Yes	70 (28,3)	18 (27,3)	0,864
No	177 (71,7)	48 (72,7)	
<b>History of having COVID-19</b>			
Yes	147 (59,5)	38 (57,6)	0,776
No	100 (40,5)	28 (42,4)	
<b>COVID-19 vaccination status</b>			
Yes	236 (95,5)	64 (97,0)	1,000
No	11 (4,5)	2 (3,0)	
<b>COVID-19 vaccine dosage</b>			
0 to 3 doses	115 (46,6)	31 (47,0)	0,953
4 or more doses	132 (53,4)	35 (53,0)	
<b>Influenza vaccine status</b>			
Yes	141 (57,1)	39 (59,1)	0,770
No	106 (42,9)	27 (40,9)	
<b>Receiving information about mpox during medical training</b>			
Yes	82 (33,2)	25 (37,9)	0,476
No	165 (66,8)	41 (62,1)	
<b>Have you heard of mpox before?</b>			
Yes	189 (76,5)	61 (92,4)	0,004
No	58 (23,5)	5 (7,6)	
<b>Presence of childhood smallpox vaccination</b>			
Yes	132 (53,4)	28 (42,4)	0,112
No	115 (46,6)	38 (57,6)	
<b>Sources used to obtain information about mpox</b>			
Family or Friends			
Yes	47 (19,0)	14 (21,2)	0,691
No	200 (81,0)	52 (78,8)	
Social Media			
Yes	92 (37,2)	17 (25,8)	0,082
No	155 (62,8)	49 (74,2)	
TV and Radio			
Yes	32 (13,0)	8 (12,1)	0,857
No	215 (87,0)	58 (87,9)	
Books			
Yes	138 (55,9)	41 (62,1)	0,362
No	109 (44,1)	25 (37,9)	



Tab. V. (follows).

	Poor Knowledge	Good Knowledge	p
	n (%)	n (%)	
<b>Research Articles</b>			
Yes	183 (74,1)	57 (86,4)	0,036
No	64 (25,9)	9 (13,6)	
<b>GAD</b>			
Minimal Anxiety	77 (31,2)	24 (36,4)	0,409
Mild Anxiety	113 (45,7)	32 (48,5)	
Moderate Anxiety	33 (13,4)	4 (6,1)	
Severe Anxiety	24 (9,7)	6 (9,1)	
<b>GAD Score</b>			
< 10	190 (76,9)	56 (84,8)	0,163
≥ 10	57 (23,1)	10 (15,2)	

Tab. VI. Comparison of responses to questions about mpox knowledge level and willingness to receive mpox vaccine among participating family physicians.

	Poor Knowledge	Good Knowledge	p
	n (%)	n (%)	
<b>I'm thinking of getting the smallpox vaccine to protect myself from mpox</b>			
Agree	43 (17,4)	14 (21,2)	0,458
Undecided	141 (57,1)	32 (48,5)	
Disagree	63 (25,5)	20 (30,3)	
<b>Mpox has decreased and I no longer need vaccination against mpox</b>			
Agree	35 (14,2)	16 (24,2)	0,019
Undecided	151 (61,1)	28 (42,4)	
Disagree	61 (24,7)	22 (33,3)	
<b>I am concerned about the potential side effects of the mpox vaccine</b>			
Agree	62 (25,1)	24 (36,4)	0,131
Undecided	128 (51,8)	26 (39,4)	
Disagree	57 (23,1)	16 (24,2)	
<b>The fact that the mpox vaccine is recommended by doctors, the community, and other professionals has a great impact on me</b>			
Agree	141 (57,1)	51 (77,3)	0,004
Undecided	90 (36,4)	10 (15,2)	
Disagree	16 (6,5)	5 (7,6)	
<b>I am willing to get vaccinated if the mpox vaccine is provided free of charge</b>			
Agree	92 (37,2)	22 (33,3)	0,127
Undecided	132 (53,4)	32 (48,5)	
Disagree	23 (9,3)	12 (18,2)	

professionals had good knowledge of mpox and 34.6% had positive attitudes towards mpox [10]. In another systematic review and meta-analysis conducted by Leon Figueroa et al., it was found that 33% of healthcare workers had good knowledge about mpox, 40% had a positive attitude towards mpox, and 58% intended to be vaccinated against mpox [11]. In a study by Alshahrani et al., the level of knowledge about mpox in the general population was reported as 48% [14]. Similarly, in study conducted by Youssef et al., it was found to be 33.04% of the level of knowledge about mpox [15]. Consistent with these findings, our study demonstrated that family physicians had both a low level of knowledge about mpox and low positive attitudes towards mpox. These findings are concerning, as insufficient knowledge regarding mpox case management, early diagnosis, and treatment way contribute to the spread of the disease and inappropriate patient care. Therefore, there is a need to

plan training programs for family physicians on mpox and mpox vaccine, to raise awareness, and to identify areas of deficiency.

Our study showed that 21.1% of family physicians had a good level of knowledge about mpox. Those with a good level of knowledge about mpox were more likely to have heard of mpox before and to use research articles as a source of information about mpox. In the systematic review and meta-analysis conducted by Jahromi et al., it was reported that 26% of healthcare workers had good knowledge of mpox, with the knowledge level of 34.8% among those with fewer than 5 years of professional experience and 41.6% among those with more than 5 years [10]. A study conducted by Sahin et al. found that only 32.5% of physicians had a good level of knowledge about mpox. In addition, women, participants over 30 years of age, participants from internal medicine departments, those who had knowledge of mpox

**Tab. VII.** Comparison of responses of participating family physician to the question, "I'm thinking of getting the smallpox vaccine to protect myself from mpox" with responses to questions about mpox, sociodemographic characteristics, and vaccination status.

	I'm thinking of getting the smallpox vaccine to protect myself from mpox			p
	Agree n (%)	Undecided n (%)	Disagree n (%)	
<b>Age</b>				
30 ≤	9 (15,8)	31 (17,9)	15 (18,1)	0,799
31-39	6 (10,5)	28 (16,2)	14 (16,9)	
40 ≥	42 (73,7)	114 (65,9)	54 (65,1)	
<b>Gender</b>				
Female	28 (49,1)	90 (52,0)	50 (60,2)	0,349
Male	29 (50,9)	83 (48,0)	33 (39,8)	
<b>Marital status</b>				
Married	39 (68,4)	119 (68,8)	65 (78,3)	0,278
Single	14 (24,6)	49 (28,3)	16 (19,3)	
Widowed/Divorced	4 (7,0)	5 (2,9)	2 (2,4)	
<b>Medical specialty</b>				
General practitioner	47 (82,5)	138 (79,8)	65 (78,3)	0,834
Family physician	10 (17,5)	35 (20,2)	8 (21,7)	
<b>Medical practice experience</b>				
Less than 1 year	8 (14,0)	24 (13,9)	8 (9,6)	0,910
1-5 years	10 (17,5)	31 (17,9)	13 (15,7)	
5-10 years	10 (17,5)	39 (22,5)	20 (24,1)	
10-20 years	14 (24,6)	42 (24,3)	18 (21,7)	
More than 20 years	15 (26,3)	37 (21,4)	24 (28,9)	
<b>Presence of a chronic illness</b>				
Yes	22 (38,6)	44 (25,4)	22 (26,5)	0,148
No	35 (61,4)	129 (74,6)	61 (73,5)	
<b>History of having COVID-19</b>				
Yes	36 (63,2)	95 (54,9)	54 (65,1)	0,239
No	21 (36,8)	78 (45,1)	29 (34,9)	
<b>COVID-19 vaccination status</b>				
Yes	54 (94,7)	166 (96,0)	80 (96,4)	0,886
No	3 (5,3)	7 (4,0)	3 (3,6)	
<b>COVID-19 vaccine dosage 0,150</b>				
0 to 3 doses	23 (40,4)	77 (44,5)	46 (55,4)	0,150
4 or more doses	34 (59,6)	96 (55,5)	37 (44,6)	
<b>Influenza vaccine status</b>				
Yes	35 (61,4)	97 (56,1)	48 (57,8)	0,777
No	22 (38,6)	76 (43,9)	35 (42,2)	
<b>Receiving information about mpox during medical training</b>				
Yes	23 (40,4)	56 (32,4)	28 (33,7)	0,542
No	34 (59,6)	117 (67,6)	55 (66,3)	
<b>Have you heard of mpox before?</b>				
Yes	48 (84,2)	130 (75,1)	72 (86,7)	0,064
No	9 (15,8)	43 (24,9)	11 (13,3)	
<b>Presence of childhood smallpox vaccination</b>				
Yes	29 (50,9)	79 (45,7)	52 (62,7)	0,039
No	28 (49,1)	94 (54,3)	31 (37,3)	
<b>Sources used to obtain information about mpox</b>				
Family or Friends				
No	42 (73,7)	138 (79,8)	72 (86,7)	0,149
Yes	15 (26,3)	35 (20,2)	11 (13,3)	
Social Media				
No	34 (59,6)	113 (65,3)	57 (68,7)	0,544
Yes	23 (40,4)	60 (34,7)	26 (31,3)	
TV and Radio				
No	48 (84,2)	150 (86,7)	75 (90,4)	0,538
Yes	9 (15,8)	23 (13,3)	8 (9,6)	
Books				
No	22 (38,6)	77 (44,5)	35 (42,2)	0,729
Yes	35 (61,4)	96 (55,5)	48 (57,8)	

Tab. VII. (follows).

	I'm thinking of getting the smallpox vaccine to protect myself from mpox.			p
	Agree n (%)	Undecided n (%)	Disagree n (%)	
<b>Research Articles</b>				
No	9 (15,8)	49 (28,3)	15 (18,1)	0,064
Yes	48 (84,2)	124 (71,7)	68 (81,9)	
<b>GAD Scale</b>				
Minimal Anxiety	20 (35,1)	52 (30,1)	29 (34,9)	0,489
Mild Anxiety	20 (35,1)	85 (49,1)	40 (48,2)	
Moderate Anxiety	10 (17,5)	19 (11,0)	8 (9,6)	
Severe Anxiety	7 (12,3)	17 (9,8)	6 (7,2)	
<b>GAD Score</b>				
10 <	40 (70,2)	137 (79,2)	69 (83,1)	0,178
10 ≥	17 (29,8)	36 (20,8)	14 (16,9)	

significantly less likely to consider getting another smallpox vaccine to protect themselves from mpox. This study has several limitations. First, it is single-center, and cross-sectional study. Therefore, the findings cannot be generalized to a broader population. Second, the low number of mpox cases in Turkey, and family physicians' unfamiliarity with the disease may have influenced their knowledge, attitudes, and behaviors. Multicenter, prospective studies with large sample sizes are needed to further elucidate these issues.

### Conclusion

In conclusion, our study found that family physicians working at Family Health Centers in Ankara province had a low level of knowledge and positive attitude towards mpox, and that their rate of considering getting the smallpox vaccine for protection against mpox was low. These results may hinder efforts to diagnose and treatment mpox cases in a timely manner. Furthermore, given the pivotal role of physicians in promoting vaccination, there is a need to enhance knowledge and awareness regarding mpox and mpox vaccine. Accordingly, it is recommended that awareness of mpox among primary care physicians be increased and that targeted training programs be implemented.

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### Conflicts of Interest Statement

The authors declare no conflict of interest.

### Author contributions

AM, EB, HG designed the study and contributed to the interpretation of the results. AM, EB processed the data

and performed the analysis. All authors discussed the results and contributed to the final manuscript.

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