

Monkeypox Unveiled: Understanding Awareness, Knowledge and Attitudes among Adults in Malaysia - A 2023 Cross-sectional study

Thin Mon Kyaw¹, Teow Xin Yi², Dharany A/P Selvaraju², April Tang Yee Ying², Sean Chan Szen Chern², Naganathan Pillai³

¹Department of Community Medicine, Faculty of Medicine, Manipal University College Malaysia, 75150 Melaka, Malaysia

²Faculty of Medicine, Manipal University College Malaysia, 75150 Melaka, Malaysia

³Department of Internal Medicine, Faculty of Medicine, Manipal University College Malaysia, 75150 Melaka, Malaysia

Corresponding author: Dr Thin Mon Kyaw Email: dr.sofi8655@gmail.com

Abstract

Background: Monkeypox is a zoonotic disease caused by the monkeypox virus and is endemic to West and Central Africa. It has similar symptoms to smallpox except lymphadenopathy which is present in monkeypox. Non-endemic countries reported instances of monkeypox since May 2022, which is the first time that many monkeypox cases were reported concurrently in both endemic and non-endemic countries in widely disparate geographical areas. The World Health Organization called for sustained efforts for long-term management of the disease in May 2023. The first case of monkeypox in Malaysia was confirmed in July 2023 and is on an increasing trend. **Methods:** An analytical cross-sectional study was conducted from 20th November to 29th December 2023. It involved 333 participants who were adult Malaysian citizens residing in Malaysia, aged 18 years and above. An online questionnaire was prepared in Google Forms, with the link being shared on various social media platforms for 2 weeks. Association between sociodemographic characteristics and attitude towards monkeypox were measured using the Chi-square test. **Results:** This research found the awareness of monkeypox among Malaysian adults was good and over half of them was deemed to have good knowledge regarding monkeypox. They also displayed a positive attitude and showed interest in learning more about monkeypox. Having good knowledge about monkeypox is associated with having a positive attitude towards it. No significant association was found between an individual's sociodemographic profile and their attitudes towards monkeypox. **Conclusion:** This study highlights good awareness and positive attitudes toward monkeypox among Malaysian adults, indicating readiness for public health challenges, though further efforts are required to address gaps in knowledge.

Keywords: monkeypox, Malaysia, awareness, knowledge, attitude

Introduction

Monkeypox (mpox) is a zoonotic disease caused by monkeypox virus, which belongs to orthopoxvirus in the Poxviridae family. (Ng & Abdul Kadir, 2023) The monkeypox virus was first discovered in Denmark (1958) in monkeys kept for research. The first reported human case of mpox was a 9-month-old boy in the Democratic Republic of the Congo (DRC, 1970). (Mpox (Monkeypox), 2023) Monkeypox has similar symptoms like smallpox which was eradicated in 1980. The only difference between both conditions is the presence of lymphadenopathy in monkeypox.

Instances of mpox have been recorded from non-endemic countries since early May 2022, and there are still instances being reported from various endemic nations. Most confirmed cases with travel history reported travel to countries in Europe and North America, rather than West or Central Africa where the mpox virus is endemic. This is the first time that many mpox cases and clusters have been reported concurrently in non-endemic and endemic countries in widely disparate geographical areas. (Mpox (Monkeypox) Outbreak 2022 - Global, 2023)

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The World Health Organization (WHO) declared mpox as a public health emergency of international concern on 23 July 2022. On May 11, 2023, WHO declared an end of the mpox emergency, and called for sustained efforts for long-term management of the disease. Singapore had the first case of monkeypox in Southeast Asia which was confirmed on 20 July 2023 (De La Vega, 2022) while in Malaysia, the first case of mpox was confirmed on 26 July 2023. In Malaysia, mpox found an increasing trend, from 2 cases reported in July 2023 to 2 cases reported in October 2023, then 5 cases reported in November 2023. Therefore, a total of 9 cases of mpox were reported. Except the first case reported had a travel history to a country with reported cases of monkeypox, the remaining 8 cases were found locally. According to CDC, 38 mpox associated deaths occurred in the US from May 10, 2022, to March 7, 2023 (1.3 mpox associated deaths per 1000 cases). In Southeast Asia, the first case of death was in Thailand which was confirmed on Aug 16.

Increasing trend of monkeypox is found in Malaysia recently. However, research on Monkeypox in Malaysia is rare, and the studies that were previously conducted regarding knowledge of Monkeypox did not have the general population of Malaysia as its target population. There are similar studies done in Malaysia but only targeting a certain population such as medical students, dental students and the community in Southern Malaysia. This research may add on information about the level of knowledge, awareness and attitude towards monkeypox in a broader aspect among the public of Malaysia.

Our general objective was to determine awareness, knowledge, and attitude towards monkeypox among adults 18 years and above in Malaysia. Our specific objectives were to determine the level of awareness, identify level of knowledge, determine level of attitude, analyze association between sociodemographic profiles and attitude, identify association between monkeypox awareness and knowledge with attitude towards monkeypox among adults 18 years and above in Malaysia. Studying the general public's knowledge, attitude and awareness of monkeypox was essential for identifying gaps in understanding and misconceptions about the disease. This information guided the development of targeted public health strategies such as educational campaigns, vaccination programs, and behavioral interventions, to prevent the spread of monkeypox within the community. Additionally, improving public health awareness fosters early detection, reduces stigma, and promotes adherence to preventive measures, ultimately enhances the outbreak control efforts for the government. This study hypothesizes that there will be a significant association between the level of awareness and knowledge about monkeypox with the attitude towards monkeypox among the adults aged 18 and above in Malaysia.

Methods

We conducted an analytical cross-sectional study from November to December 2023 among adults in Malaysia. The target population of this study was adults aged 18 years and above residing in Malaysia. For the sample size of this research, an anticipated frequency of 25.8% was adopted based on the study by Kumareswaran et al. (2022). An online software called OpenEpi was utilized, and with a confidence level of 95%, the minimum sample size was calculated to be 295. This research anticipated a 10% non-response rate, thus at least 328 participants were needed for this research. We included those participants aged 18 years and above and participants that can read, understand, and answer the questionnaire in English independently. Participants who are not citizens or permanent residents of Malaysia, participants in Malaysia who are international students and participants who are citizens or permanent residents of Malaysia that currently not residing in Malaysia were excluded. A convenient sampling method was used in the recruitment of participants for this research. Questionnaires were prepared in Google Forms and distributed to the public using social media platforms according to the convenience of the researchers. It was selected as the preferred sampling method due to geographical proximity and easy accessibility, especially with limited research duration.

An online questionnaire was employed to assess the public's awareness, knowledge and attitude towards monkeypox. The questionnaire was prepared using Google Forms and the link was distributed to the public via social media platforms such as email, WhatsApp, Telegram, Instagram and Facebook. The online questionnaire continued for 2 weeks.

The questionnaire comprised of 5 sections, namely: Section 1: Introduction of Research and Consent Form, Section 2: Sociodemographic Characteristics (9 questions), Section 3: Knowledge on Monkeypox (15 questions), Section 4: Awareness of Monkeypox (3 questions) and Section 5: Attitude towards Monkeypox (15 questions). The questions regarding knowledge, awareness and attitude towards monkeypox were adopted from previous studies by Lin et al. (2022) and Alshahrani et al. (2022). Three answer options (Agree, Neutral,

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Disagree) were given to assess the level of knowledge, awareness, and attitude towards monkeypox. For 'Knowledge on Monkeypox', a score of 1 was given to correct answers and 0 was given for wrong and 'Neutral' answers. For 'Awareness of Monkeypox' and 'Attitude towards Monkeypox', each question was given 1 for 'Agree' and 0 for 'Disagree' and 'Neutral'.

A pilot test was conducted among 20 individuals who were general adult population aged 18 years and above including both male and female. The internal consistency and validity of the questions were evaluated using Cronbach's alpha. Cronbach's alpha of 0.7321 was obtained from the calculation. With a cutoff point of 0.7, the questionnaire had an acceptable internal consistency, thus we proceeded with utilizing the questionnaire in our research.

The descriptive data was presented as frequency and percentage or as median and interquartile range (for age). The level of knowledge and awareness of the participants were categorized into 2 categories, namely, 'Unsatisfactory' for those who scored 0 – 8 in Knowledge on Monkeypox and 'Satisfactory' for those scored 9 – 15; as well as 'Negative attitude' for scores of 0 – 8 in Attitude towards Monkeypox and 'Positive attitude' for scores from 9 – 15. The software selected was the Statistical Package for the Social Sciences (SPSS) (Version 29.0 2.0 (20)). The dependent and independent variables were compared using chi-square test. P-value of <0.05 is to be set as statistically significant.

Ethical consideration

Participants included in our study were solely voluntary in nature, and to ensure understanding and the freedom to withdraw at any moment, the informed consent was obtained prior to enrolment of the study. Anonymized data were safely preserved, with only the research team having access to the data. The ethical approval was obtained from Research Ethics Committee, Manipal University College Malaysia (MUCM). (Ref: MUCM/ Research Ethics Committee – 063/2023).

Results

The final sample of the study was 333. The characteristics of respondents were displayed in Table 3.1. The median age of 333 respondents was 22 years (IQR: 21-34). Majority of respondents were female (65.77%). Most of them were Chinese (58.56%). In terms of place of residence, most respondents were from urban areas (81.68%). Most respondents had tertiary education (72.07%). Most of the respondents were single (74.18%). Among 333 respondents, 202 of them (60.66%) were students. In terms of personal income, 51.65% of respondents were students.

Table 3.1: Sociodemographic characteristics of the respondents (n= 333)

Variables	n (%) or Median (IQR)
Age (years)	22 (21, 34)
Gender	
Male	114 (34.23)
Female	219 (65.77)
Race	
Malay	27 (8.11)
Chinese	195 (58.56)
Indian	93 (27.93)
Others ^a	18 (5.40)
Place of residence	
Rural area	61 (18.32)
Urban area	272 (81.68)
Education level	
No formal education	0 (0)
Primary education	0 (0)
Secondary education	19 (5.71)

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Post-secondary education	74 (22.22)
Tertiary education	240 (72.07)
Employment status	
Employed (Full-time)	99 (29.73)
Employed (Part-time)	10 (3.01)
Unemployed	8 (2.40)
Retired	14 (4.20)
Student	202 (60.66)
Marital status	
Single	247 (74.18)
Married	82 (24.62)
Others ^b	4 (1.20)
Personal income	
< RM1500	31 (9.31)
RM1500 – RM3000	40 (12.01)
RM3001 – RM5000	33 (9.91)
RM5001 – RM10000	37 (11.11)
> RM10000	20 (6.01)
Student	172 (51.65)

RM: Malaysian Ringgit

^aAny other races in Malaysia apart from Malay, Chinese and Indian.

^bOthers include divorced, single father and widower.

Table 3.2 showed the respondents' knowledge towards monkeypox. The most correctly responded item was 'Monkeypox is a viral disease infection' (86.49%) while the least correctly responded item was 'Paracetamol is one of the treatment options for symptomatic monkeypox' (59.76%).

Table 3.2: Level of knowledge towards monkeypox (n= 333)

Items	n (%)
Monkeypox is prevalent in Southeast Asian countries.	
Agree*	144 (43.24)
Neutral	124 (37.24)
Disagree	65 (19.52)
Monkeypox is prevalent in Western and Central Africa.	
Agree*	213 (63.96)
Neutral	108 (32.43)
Disagree	12 (3.60)
Monkeypox is a viral disease infection.	
Agree*	288 (86.49)
Neutral	37 (11.11)
Disagree	8 (2.40)
Monkeypox is a bacterial disease infection.	
Agree	90 (27.03)
Neutral	49 (14.71)
Disagree*	194 (58.26)
Monkeypox is usually self-limiting with the symptoms lasting from 2 to 4 weeks.	
Agree*	197 (59.16)
Neutral	117 (35.14)
Disagree	19 (5.71)

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Monkeypox can be transmitted through close contact with lesions, body fluids, respiratory droplets, and contaminated materials.

Agree*	280 (84.08)
Neutral	46 (13.81)
Disagree	7 (2.10)

Monkeypox and smallpox have similar signs and symptoms.

Agree*	208 (62.46)
Neutral	95 (28.53)
Disagree	30 (9.01)

Monkeypox and COVID-19 have similar signs and symptoms.

Agree	86 (25.83)
Neutral	104 (31.23)
Disagree*	143 (42.94)

Diarrhoea is one of the early symptoms of monkeypox.

Agree	113 (33.93)
Neutral	140 (42.04)
Disagree*	80 (24.02)

Monkeypox typically presents with fever, rash, and swollen lymph nodes.

Agree*	274 (82.28)
Neutral	50 (15.02)
Disagree	9 (2.70)

Paracetamol is one of the treatment options for symptomatic monkeypox.

Agree*	134 (40.24)
Neutral	121 (36.34)
Disagree	78 (23.42)

Antibiotics is one of the treatment options for symptomatic monkeypox.

Agree	115 (34.53)
Neutral	80 (24.02)
Disagree*	138 (41.44)

An antiviral agent that was developed for smallpox was licensed for monkeypox treatment.

Agree*	172 (51.65)
Neutral	139 (41.74)
Disagree	22 (6.61)

People who received chickenpox vaccine are immunized against monkeypox.

Agree	57 (17.12)
Neutral	125 (37.54)
Disagree*	151 (45.35)

Healthcare workers are at a greater risk of monkeypox infection.

Agree*	210 (63.06)
Neutral	88 (26.43)
Disagree	35 (10.51)

* Indicates the correct answer.

Table 3.3 showed the respondents' awareness towards monkeypox. The majority of the respondents were aware of the existence of monkeypox disease (80.78%) and aware that monkeypox has emerged in countries where the disease is not endemic (73.27%). In terms of awareness on the World Health Organization has declared monkeypox a public health emergency of international concern, most of the respondents were aware (60.06%).

Table 3.3: Level of awareness towards monkeypox (n= 333)

Items	n (%)
I am aware of the existence of monkeypox disease.	
Agree	269 (80.78)
Neutral	43 (12.91)
Disagree	21 (6.31)
I am aware that monkeypox has emerged in countries where the disease is not endemic.	
Agree	244 (73.27)
Neutral	63 (18.92)
Disagree	26 (7.81)
I am aware that the World Health Organization has declared monkeypox a public health emergency of international concern.	
Agree	200 (60.06)
Neutral	88 (26.43)
Disagree	45 (13.51)

Table 3.4 showed the respondents' attitude towards monkeypox. 58.86% of respondents were concerned that the monkeypox virus will become a worldwide pandemic. 82.28% of respondents were interested to learn about monkeypox prevention and management. 80.78% of respondents were interested to learn about the epidemiology of this emerging monkeypox disease and 78.38% of respondents would like to learn more about epidemiology of new emerging diseases. Among 333 responses, 240 (72.07%) agreed that visiting a place where there is a monkeypox epidemic is dangerous. 243 (72.97%) responses agreed that monkeypox outbreak will affect their daily activities. 64.86% of 333 respondents agreed that they play a major role in preventing the outbreak of monkeypox disease. More than half of the respondents (64.56%) were ready to receive vaccination for monkeypox disease. 70.87% respondents were sure that the global population will be able to control the monkeypox virus epidemic. 64.26% respondents believed that monkeypox virus prevention and control measures are adequately available. Around 50% of respondents denied they have negative feelings about the monkeypox virus. The majority of the respondents (78.98%) believed that monkeypox virus adds additional strain on the healthcare system of the affected countries. Most of the respondents (83.18%) believed that media coverage of monkeypox virus may have an impact on its global prevention. Around 60% of the respondents denied monkeypox virus will become a new pandemic, and its impact will be like COVID-19. Around 76% of the respondents believed that travelling to monkeypox virus infected countries is risky.

Table 3.4: Level of attitude towards monkeypox (n= 333)

Items	n (%)
I am concerned that the monkeypox virus will become a worldwide pandemic.	
Agree	196 (58.86)
Neutral	89 (26.73)
Disagree	48 (14.41)
I am interested to learn about monkeypox prevention and management.	
Agree	274 (82.28)
Neutral	52 (15.62)
Disagree	7 (2.10)
I am interested to learn about the epidemiology of this emerging monkeypox disease.	
Agree	269 (80.78)
Neutral	57 (17.12)
Disagree	7 (2.10)
I think that visiting a place where there is a monkeypox epidemic is dangerous.	

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Agree	240 (72.07)
Neutral	62 (18.62)
Disagree	31 (9.31)
I think that the monkeypox outbreak will affect my daily activities.	
Agree	243 (72.97)
Neutral	71 (21.32)
Disagree	19 (5.71)
I think that I play a major role in preventing the outbreak of monkeypox disease.	
Agree	216 (64.86)
Neutral	98 (29.43)
Disagree	19 (5.71)
I am ready to receive vaccination for monkeypox disease.	
Agree	215 (64.56)
Neutral	88 (26.43)
Disagree	30 (9.01)
I am sure that the global population will be able to control the monkeypox virus epidemic.	
Agree	236 (70.87)
Neutral	86 (25.83)
Disagree	11 (3.30)
I believe that monkeypox virus prevention and control measures are adequately available.	
Agree	214 (64.26)
Neutral	98 (29.43)
Disagree	21 (6.31)
I have negative feelings about the monkeypox virus.	
Agree	150 (45.05)
Neutral	148 (44.44)
Disagree	35 (10.51)
I believe that monkeypox virus adds additional strain on the healthcare systems of the affected countries.	
Agree	263 (78.98)
Neutral	59 (17.72)
Disagree	11 (3.30)
I believe that media coverage of monkeypox virus may have an impact on its global prevention.	
Agree	277 (83.18)
Neutral	47 (14.11)
Disagree	9 (2.70)
I think monkeypox virus will become a new pandemic, and its impact will be like COVID-19.	
Agree	130 (39.04)
Neutral	121 (36.34)
Disagree	82 (24.62)
I would like to learn more about epidemiology of new emerging diseases.	
Agree	261 (78.38)
Neutral	62 (18.62)
Disagree	10 (3.00)
I believe that travelling to monkeypox virus infected countries is risky.	

Agree	253 (75.98)
Neutral	61 (18.32)
Disagree	19 (5.71)

Table 3.5 showed results of the test of association using chi-square test conducted between sociodemographic and attitude towards monkeypox. The ages were categorized into intervals of 10 years. For the races, Malay and other races were combined into one category. For employment status, both full-time and part-time employed participants were categorized as “Working” while the unemployed, retired and students were categorized as “Not working”. In terms of marital status, both single and others (divorced, single father and widower) were categorized as “Unmarried”. The personal income was recategorized using RM1500 and RM5000 as cut-off values. We found no significant associations between sociodemographic factors and attitudes, indicating attitudes toward monkeypox were consistent across groups ($P > 0.05$).

Table 3.5: Association between sociodemographic characteristics and attitude towards monkeypox (n= 333)

Variables	Positive Attitude [n (%)]	OR (95% CI)	P-value ^a
Age (years)			
18 – 27	169 (74.78)	Reference	
28 – 37	25 (71.43)	0.84 (0.38, 1.86)	0.673
38 – 47	22 (78.57)	1.24 (0.48, 3.20)	0.661
≥ 48	29 (65.91)	0.65 (0.33, 1.30)	0.224
Gender			
Male	81 (71.05)	Reference	
Female	164 (74.89)	1.22 (0.73, 2.02)	0.452
Race			
Malay and Others ^b	36 (80.00)	Reference	
Chinese	141 (72.31)	0.65 (0.30, 1.45)	0.290
Indian	68 (73.12)	0.68 (0.29, 1.61)	0.379
Place of residence			
Rural area	45 (73.77)	Reference	
Urban area	200 (73.53)	0.99 (0.53, 1.9)	0.969
Education level			
Secondary education	11 (57.89)	Reference	
Post secondary education	56 (75.68)	2.26 (0.79, 6.49)	0.123
Tertiary education	178 (74.17)	2.09 (0.80, 5.43)	0.124
Employment status			
Working	76 (69.72)	Reference	
Not working	169 (75.45)	1.33 (0.80, 2.22)	0.267
Marital status			
Unmarried	188 (74.90)	Reference	
Married	57 (69.51)	0.76 (0.44, 1.32)	0.337
Personal income			
< RM1500	153 (75.37)	Reference	
RM1500 – RM5000	52 (71.23)	0.81 (0.45, 1.47)	0.488
> RM5000	40 (70.18)	0.77 (0.40, 1.48)	0.428

OR: Odds ratio; RM: Malaysian Ringgit

^aP-value of chi-square test. P-value ≤ 0.05 indicates statistical significance.

^bAny other races in Malaysia apart from Malay, Chinese and Indian.

Table 3.6 showed results of chi-square test for association between monkeypox awareness and knowledge with attitude towards monkeypox. There was a significant association between monkeypox awareness and attitude

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towards monkeypox with P-value <0.001. Besides, the results also proved that there was a significant association between monkeypox knowledge and positive attitude towards monkeypox with P-value <0.001.

Table 3.6: Association between monkeypox awareness and knowledge with positive attitude towards monkeypox (n= 333)

Variables	OR (95% CI)	P-value^a
Knowledge on Monkeypox		
Poor knowledge	Reference	
Good knowledge	2.64 (1.60, 4.36)	< 0.001
Awareness		
Poor awareness	Reference	
Good awareness	2.58 (1.52, 4.40)	< 0.001

OR: Odds ratio

^aP-value of chi-square test. P-value ≤ 0.05 indicates statistically significant.

Discussion

Although WHO had called for an end of the mpox emergency on 11 May 2023, cases of mpox had started to emerge in Malaysia after the declaration, which led to a total of 9 mpox cases detected from July to November 2023 in the country. Several studies were done in Malaysia to assess the level of knowledge, awareness and attitude among different groups of Malaysians (Kumareswaran et al., 2022; Raman et al., 2023; Sim et al., 2022). However, all of these studies were done prior to any mpox cases detected in Malaysia. This study assessed the level of knowledge, awareness and attitude towards mpox among Malaysians after detection of mpox cases in the country.

The current study included adults from various background among the general population in Malaysia as study participants. In general, 56.16% of the study participants had good knowledge regarding mpox. Over half of the respondents were well-informed about the prevalence, transmission, and symptoms of mpox. The current study is consistent with earlier research among public in ShenZhen, China where 56.5% of the Chinese population had good mpox knowledge (Ren et al., 2023). Swed et al. (2023) found that 56.2% of the population in 17 Arabic countries had good to excellent knowledge about mpox. Another study in Saudi Arabia showed only around half (48%) of the Saudi population had good mpox knowledge (Alshahrani et al., 2022). A study in Iraq by Ahmed et al. (2023) showed the Iraqis population had moderate knowledge regarding mpox. In Malaysia, similar studies conducted by Kumareswaran et al. (2022) among population in Southern Malaysia and Raman et al., (2023) among medical students showed 25.8% and 49.3% were having good knowledge about mpox respectively. The increase in knowledge about mpox may be attributable to the widespread of mpox information and prevention methods on social media after the detection of first mpox case in Malaysia.

To identify the common gaps in mpox-related knowledge, a few aspects were brought into comparison with other studies. In this study, more than half of the population lack of knowledge about treatments and vaccines available for mpox. Only 40.24% knew that Paracetamol is one of the treatment options for symptomatic mpox and only 45.35% knew that that people who received chickenpox vaccine is not immunized against mpox. Among general population in Bangladesh, 66.6% among those who were aware of mpox had insufficient knowledge about mpox vaccination (Nath et al., 2022). This may reflect the public's misconception about vaccine and drug information due to the spreading of media news about the development of new vaccines and drugs that are yet to be used widely. Previous studies showed some people gained knowledge regarding mpox

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from social media (Alshahrani et al., 2022; Gallè et al., 2022). Even those who never heard about mpox disease may also come to know about it by questionnaires sent through social media. Thus, false information that is shared online has the potential to easily mislead people. Correct, intelligible, and clear messages regarding mpox should be taught in public health education, particularly offline teaching that takes place around people.

Regarding level of awareness of mpox, 75.38% of study participants were aware about mpox disease. The reason for the participants in having good level of awareness can be related with the fact that the mpox cases had been reported throughout Southeast Asia, including Malaysia. According to another research, 65.3% of population were aware of the worldwide outbreak of mpox among public in China (Ren et al., 2023). Our findings contrast with the study conducted by Nath et al., (2022) in Bangladesh which showed a general lack of awareness since no cases have ever been occurred in the country. A high level of awareness is essential to target the reduction of transmission and to minimize the disease burden on the community and the nation.

Regarding the attitude towards mpox, in terms of the interest in learning about mpox prevention and management, concern about vaccination, disease control and risk of travelling to other countries, the results showed that the participants held good attitude (73.57%) towards mpox. This may be attributable to the good level of knowledge and awareness among the participants. A previous study conducted among Lebanese population showed an average attitude towards mpox with a mean of 11.78 ± 2.63 for a maximum index of 20 (Jamaledine et al., 2022). In addition to that, 64.56% of respondents of our study are ready to receive mpox vaccination. These findings correspond with previous studies where high willingness to accept mpox vaccination were found among population in Italy and in China (Dong et al., 2023; Gallè et al., 2022). Study by Swed et al. (2023) in Arab showed majority of the population are willing to accept mpox vaccination.

This study found no significant association between the participants' sociodemographic profile and their attitude towards mpox. However, some differences in the level of attitude can be appreciated in each sociodemographic profile. This study found that female participants held a more positive attitude than male participants. These findings contrast with previous research which found that male participants were more positive in their attitude (Ahmed et al., 2022). For education level, participants who held post-secondary education had more positive attitude towards mpox than participants who held secondary education and tertiary education. These findings were in contrast with study by Ahmed et al., (2023) in Kurdistan region of Iraq where individual with a bachelor's degree held more positive attitudes than people with diplomas. Moreover, in this study, those who were not working and unmarried, which comprised of mostly students, had a more positive attitude than those who were working and married. The research conducted in China by Ren et al. (2023) showed a higher level of worry about mpox among working and married individuals. This may be due to a greater sense of responsibility held by working and married individuals in their career and families thus creating a greater concern about mpox, leading to a more negative attitude towards mpox.

In terms of the association between mpox knowledge and attitude towards mpox, the results proved that there was a significant association between mpox knowledge and attitude towards mpox with $P\text{-value} < 0.001$. 81.82% of those who have good knowledge of mpox disease have a more positive attitude towards mpox. Study by Gallè et al., (2022) showed that higher knowledge score was associated with more favorable to vaccination, more concerned about the mpox infection and more willing to alter their habits for disease prevention.

The findings of this study revealed that majority of the respondents were aware of the existence of monkeypox disease (80.78%) and most of them (82.28%) were interested to learn about monkeypox prevention and management among the Malaysian population regarding monkeypox. These results were consistent with the findings reported in Saudi Arabia during 2022 probably due to differences in cultural and social contexts where public health campaigns and access to healthcare information were somewhat different with Malaysia (Alshahrani, N.Z. et al., 2022). This may be possibly influenced by unique cultural beliefs or lower exposure to formal health education initiatives in certain segments of the Malaysian population. Furthermore, Malaysia's multicultural society, with its diverse ethnic, linguistic, and religious backgrounds, may contribute to variations

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in knowledge and attitudes compared to more homogenous populations. For instance, specific cultural factor, e.g., reliance on traditional medicine or trust in community leaders might influence health-seeking behavior and perceptions of monkeypox risk. These differences underscore the importance of tailoring health education programs to address the specific needs and sociocultural contexts of the Malaysian population.

The large number of the population who expressed positive attitude is encouraging as it is important in controlling the mpox disease. This study also showed significant association between mpox awareness and attitude towards mpox (P-value < 0.001) where 78.5% of participants with good awareness have more positive attitude towards mpox. These findings are gratifying as having a better knowledge, awareness and attitude towards mpox would encourage a better cooperation from the population with the government in taking any necessary steps regarding mpox.

There were some limitations in this study. First, the cause-effect relationship between the studied variables cannot be established through this cross-sectional study. Second, the selection of samples using convenience sampling method may lead to limited generalizability. Third, a larger sample size was not able to be obtained thus may affect the representativeness of the sample for the whole Malaysian population. Besides, majority of the studied samples were made up of students and those aged between 19 to 24 years old, which do not reflect to the actual population in Malaysia. This may be due to the distribution of questionnaires mainly amongst the students and through social media attended by individuals of similar age groups. Further studies with a larger sample size and with greater generalization should be conducted in the future.

Conclusion

This cross-sectional study provides a valuable insight into a Malaysian adult's view towards monkeypox, following the emergence of the disease in the country. A good level of awareness on the existence of monkeypox was found among the adult population of Malaysia (18 years and above). Just over half of the adult population in Malaysia can be said to have good knowledge regarding monkeypox. The attitudes of Malaysian adults towards monkeypox can be described to be inquisitive, with most respondents showing interest to learn more about the disease, as well as optimistic as a majority believed that any emerging monkey pandemic will be dealt with effectively by the global population. A strong association between monkeypox knowledge and attitudes is apparent, as those having good knowledge were significantly more likely to have a positive attitude regarding monkeypox compared to those without. From a sociodemographic standpoint however, no significant association was found between a person's sociodemographic profile and their attitudes towards monkeypox. All in all, our research suggests that the Malaysian adult population is well positioned and well informed to handle a monkeypox pandemic, should the need ever arise.

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Conflict of Interest

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