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Monkeypox awareness, knowledge, and attitude among undergraduate preclinical and clinical students at a Malaysian dental school: An emerging outbreak during the COVID–19 era

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ABSTRACT

Objective: To evaluate the awareness, knowledge, and attitude on monkeypox viral infection among preclinical and clinical dental students in Malaysia.

Methods: A cross-sectional study was conducted among 229 preclinical and clinical dental students *via* an online self-reported questionnaire. The questionnaire included 3 items on awareness, 15 items on knowledge, 9 items on attitude and 2 open-ended questions. Data were presented as frequencies and percentages. *Chi-square* test was used to compare knowledge and awareness scores between preclinical and clinical dental students and content analysis was performed for open-ended responses.

Results: Preclinical and clinical dental students were aware of the existence of monkeypox (89.5% and 94.4%, respectively), that the disease emerged in non-endemic countries (81.0% and 87.1%, respectively) and that it was declared a public health emergency of international concern by the World Health Organization (73.3% and 79.0%, respectively). Clinical dental students' overall knowledge level was significantly higher than preclinical dental students ($P=0.014$). Both preclinical (95.2%) and clinical (96.8%) dental students demonstrated positive attitudes toward monkeypox with no significant difference ($P=0.736$) noted between them. Three themes emerged from the open-ended questions: (1) reimplementation of nationwide lockdown, (2) impact on the economy and health, and (3) disruption to the educational system. Students also anticipated their face-to-face learning to be reduced should there be a new outbreak.

Conclusions: Both preclinical and clinical dental students showed comparable awareness and attitudes, while the latter demonstrated greater satisfactory knowledge toward the re-emergence of monkeypox during the COVID-19 pandemic. Nonetheless, efforts to improve dental students' understanding of this alarming outbreak are required, to safeguard their health and minimise transmission.

KEYWORDS: Communicable disease; Monkeypox virus; Public health; Tropical disease; Zoonoses

1. Introduction

Monkeypox virus, a double-stranded DNA virus with an envelope that spreads by zoonotic infection, is a member of the same *Orthopoxvirus* genus of the Poxviridae family[1]. Despite being

Significance

The monkeypox virus was declared as a public health emergency of international concern by the World Health Organization in July 2022. The aim of the current study was to evaluate the awareness, knowledge, and attitude on the re-emerging outbreak of monkeypox viral infection among undergraduate dental students in Malaysia. Generally, both preclinical and clinical dental students showed acceptable awareness, knowledge, and attitudes toward the re-emergence of monkeypox during the COVID-19 pandemic. The present results may be insightful in establishing the fundamental knowledge of healthcare professionals involved in the early prevention, diagnosis, and monitoring of this potentially dangerous infectious disease.

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known as 'monkeypox', the natural history of the disease remains uncertain. Nevertheless, its history can be traced back to 1958, when it was first discovered in an animal facility in Denmark through polio vaccine research involving monkey colonies[2]. The first human case was reported in 1970 involving a 9-month-old baby boy in Zaire[3], and since then, it has been reported in more than 16 500 cases worldwide. Monkeypox cases are usually found close to tropical rainforest areas in central and west Africa. Thus, cases beyond the continents of Africa are believed to be connected to recent foreign travel to endemic regions or through imported animals.

Monkeypox has a similar clinical presentation to smallpox, but it is less severe and rarely fatal. The monkeypox virus incubation period might last from 5 to 21 days. In the first three days, the prodromic febrile phase presents with vague symptoms such as fever, lethargy, headache, lymphadenopathy, back pain, and myalgia[4]. After the fever has subsided, the exanthem stage, which typically lasts 2-4 weeks, starts with the face and spreads centrifugally throughout the body[4,5]. The widespread feature of monkeypox viral infection can be distinguished from other viral fevers such as the occurrence of lymphadenopathy[6]. Nevertheless, the risk of the worldwide transmission of this emerging monkeypox infection has increased with the reopening of nation borders following the COVID-19 pandemic[7,8]. In response to the escalating monkeypox outbreak, the World Health Organization (WHO) has raised the alert status to its highest level and declared the virus a public health emergency of international concern to halt it from spreading and possibly morphing into a pandemic[9].

The rise in cases of human monkeypox highlights the significance of healthcare professionals in practising disease prevention, early identification, prompt reaction, and management[10]. Notwithstanding, one of the challenges in tackling an infectious outbreak among healthcare professionals is their awareness, knowledge and attitude towards the disease itself[11]. It is imperative that healthcare professionals are aware of and well-prepared for cases of monkeypox even if there have not been any monkeypox cases reported in Malaysia as of 30th July 2022. Due to the nature of dental education which emphasises more on the clinical aspects, the risk of cross-infection between dental professionals and patients is high from routine dental aerosol-generating procedures[12,13]. Despite not being an airborne disease, monkeypox may spread through respiratory droplets, according to a statement made by the WHO, jeopardizing the safety of dental practitioners and dental students[14]. Therefore, dental practitioners and dental students need to take extreme caution and develop preventive strategies to avoid transmission of this emerging disease when performing aerosol-generating dental procedures.

Assessing students' awareness of emerging viral infections might be useful for determining their readiness as future health providers and willingness to assist during infectious disease outbreaks[12]. In

addition, understanding health-seeking behaviour, particularly the propensity to adhere to preventative measures, could be affected by the relationship between lack of knowledge and attitude toward conspiracy ideas[13]. Attitudes that are based on substantial quantities of knowledge are more lasting, consequential, and effective behaviour predictors than attitudes that are based on little or erroneous knowledge[15]. Thus, the overarching aim of the current study was to evaluate the awareness, knowledge, and attitude on the re-emerging outbreak of monkeypox viral infection among preclinical and clinical dental students in Malaysia.

2. Subjects and methods

2.1. Sample size calculation

The sample size was calculated using Power and Sample size calculation (PS) software version 3.1 based on a two-proportion comparison with $\alpha=0.05$, $\beta=0.8$, and a between-group ratio of 1:1. The proportion of clinical students with overall good knowledge and attitude was estimated to be 0.55, and the detectable difference was set at 0.2. The calculated sample size for each group was 96. Allowing for a 20% non-response rate, the total sample size of the present study was 220 respondents.

2.2. Study design

The present cross-sectional study was carried out at the Faculty of Dentistry, Asian Institute of Medicine, Science and Technology (AIMST) University, Malaysia. Ethical approval was granted by the AIMST University Human Ethic Committee (AUHEC) with the ethical approval code: AUHEC/FOD/2022/25. Convenient sampling was used to recruit undergraduate dental students who are currently studying at the Faculty of Dentistry, AIMST University. Conversely, undergraduate students from other faculties, as well as dental students from other dental schools were excluded from the current study. An online questionnaire was employed to assess undergraduate dental students' awareness, knowledge, and attitude toward monkeypox. The online questionnaire was prepared using Google Forms and the link was distributed to the students *via* WhatsApp groups. Students voluntarily and anonymously participated in the online survey once informed electronic consent was obtained. They were given two weeks to complete the questionnaire (25th July 2022 to 7th August 2022).

2.3. Questionnaire design

The questionnaire items used in the present study were adopted and modified from previous similar studies[16,17]. The questionnaire

consisted of 29 questions, of which 27 were close-ended and the remaining two were open-ended questions. Two dental public health experts performed content validation of the questionnaire before it was distributed to the participants. The questionnaire was categorised into four sections. The first section comprised three items with three answer options (Yes, No and Unsure) to assess students' awareness. The second section of the questionnaire consisted of 15 items to evaluate students' knowledge. Respondents who answered correctly were scored as 1, whereas those who answered incorrectly were scored as 0. No mark was given for respondents who answered 'Unsure'. The sum of the score represented the knowledge score with 0-8 scores being considered 'Unsatisfactory', while 9-15 scores are considered 'Satisfactory'. The third section of the questionnaire consisted of 9 items to assess students' attitudes. A 3-point Likert scale (Agree, Neutral, and Disagree) was employed. The attitude score for each item was 0 for 'Disagree' or 'Neutral', and 1 for 'Agree'. A positive attitude is deemed when the total attitude score is ≥ 5 . The fourth section of the questionnaire comprised 2 open-ended questions: (1) What would be your major concern if there was a monkeypox outbreak? (2) How would you anticipate your academic learning in dental school if there was a monkeypox outbreak?

2.4. Data analysis

The questionnaire items' construct validity and internal consistency were evaluated using Cronbach's alpha and confirmatory factor analysis by principal components analysis varimax rotation. The construct validity is demonstrated by factor loadings of at least ≥ 0.30 for each item. Internal consistency reliability was analysed using *post-hoc via* calculating Cronbach's alpha coefficients for each construct, with a cut-off point of 0.7 regarded as acceptable. Data were analysed using the IBM Statistical Package for the Social Sciences (SPSS) for Windows, Version 22.0. (Armonk, NY: IBM Corp., USA). Data were presented as frequencies and percentages. *Chi-square* test was used to compare knowledge and awareness scores between preclinical and clinical dental students, with a significance level of 0.05. Moreover, content analysis was performed for open-ended responses. First, two researchers (GSSL & WW) used NVIVO 12 software to construct the initial code. The initial codes were used as a guide for further coding until no additional code can be found from the respondents' feedback. This is then followed by refining and labelling the codes into different categories. Any coding disputes were discussed with the third investigator (HH) until consensus is obtained. The entire research team refined and approved all the final codes.

3. Results

A total of 229 students (70.5% response rate) participated in this

study, of which 105 (45.9%) of them were preclinical students and the remaining 124 (54.1%) were clinical students. In addition, 154 students (67.2%) were female, while the remaining 75 students (32.8%) were male. Cronbach alpha and confirmatory factor analysis showed coefficient values of 0.76 and 0.70, respectively, suggesting acceptable validity and reliability of the questionnaire items. Students' awareness of the monkeypox disease is shown in Table 1. Both preclinical and clinical dental students were aware that monkeypox existed (89.5% and 94.4%, respectively), and the disease has emerged in non-endemic countries (81.0% and 87.1%, respectively). Moreover, both preclinical and clinical dental students were aware that the WHO had declared the disease a public health emergency of international concern (73.3% and 79.0%, respectively). However, no significant differences were noted between preclinical and clinical dental students among these three awareness items (*P*-values: 0.170, 0.203, and 0.311, respectively).

Table 2 showed the students' knowledge of monkeypox disease. Most questionnaire items revealed no significant difference ($P > 0.05$) between preclinical and clinical dental students except for items 3, 4, 5, 11, 12 and 13. The least correctly responded item among preclinical dental students was '*Paracetamol is one of the treatment options for symptomatic monkeypox*'; while the least correctly responded item among clinical dental students was '*Diarrhoea is one of the early symptoms of monkeypox*'. Furthermore, clinical dental students' overall knowledge level was significantly higher ($P = 0.014$) than that of preclinical dental students with 90 (72.6%) clinical students considered 'Satisfactory' as compared to only 42 (40.0%) students 'Satisfactory' among the preclinical group. Table 3 showed the attitude of preclinical and clinical dental students toward monkeypox disease. A total of 100 (95.2%) preclinical and 120 (96.8%) clinical dental students demonstrated positive attitudes with no significant difference ($P = 0.736$) between them. Nevertheless, significant differences between preclinical and clinical students' attitudes were noted in items 2 and 9 (*P*-values: 0.003 and 0.001, respectively).

Table 1. Awareness of monkeypox between preclinical ($n=105$) and clinical ($n=124$) dental students.

Item	Preclinical, <i>n</i> (%)	Clinical, <i>n</i> (%)	<i>P</i> value ^a
I am aware of the existence of monkeypox disease.			
No / Unsure	11 (10.5)	7 (5.6)	0.170
Yes	94 (89.5)	117 (94.4)	
I am aware that the monkeypox has emerged in countries where the disease is not endemic.			
No / Unsure	20 (19.0)	16 (12.9)	0.203
Yes	85 (81.0)	108 (87.1)	
I am aware that the World Health Organization has declared monkeypox a public health emergency of international concern.			
No / Unsure	28 (26.7)	26 (21.0)	0.311
Yes	77 (73.3)	98 (79.0)	

^a*Chi-square* test for independence.

Table 2. Knowledge on monkeypox between preclinical (n=105) and clinical (n=124) dental students.

Item	Correct response		P value ^a
	Preclinical, n (%)	Clinical, n (%)	
1. Monkeypox is prevalent in Southeast Asian countries.	31 (29.5)	50 (40.3)	0.089
2. Monkeypox is prevalent in Western and Central Africa.	73 (69.5)	93 (75.0)	0.355
3. Monkeypox is a viral disease infection.	86 (81.9)	115 (92.7)	0.013 ^b
4. Monkeypox is a bacterial disease infection.	63 (60.0)	105 (84.7)	0.001 ^b
5. Monkeypox is usually self-limiting with the symptoms lasting from 2 to 4 weeks.	43 (41.0)	69 (55.6)	0.027 ^b
6. Monkeypox can be transmitted through close contact with lesions, body fluids, respiratory droplets, and contaminated materials.	93 (88.6)	108 (87.1)	0.734
7. Monkeypox and smallpox have similar signs and symptoms.	61 (58.1)	74 (59.7)	0.808
8. Monkeypox and COVID-19 have similar signs and symptoms.	59 (56.2)	66 (53.2)	0.653
9. Diarrhoea is one of the early symptoms of monkeypox.	26 (24.8)	34 (27.4)	0.649
10. Monkeypox typically presents with fever, rash, and swollen lymph nodes.	78 (74.3)	104 (83.9)	0.074
11. Paracetamol is one of the treatment options for symptomatic monkeypox.	24 (22.9)	49 (39.5)	0.007 ^b
12. Antibiotics is one of the treatment options for symptomatic monkeypox.	34 (32.4)	62 (50.0)	0.007 ^b
13. An antiviral agent that was developed for smallpox was licensed for monkeypox treatment.	30 (28.6)	59 (47.6)	0.003 ^b
14. People who received chickenpox vaccine are immunized against monkeypox.	46 (43.8)	58 (46.8)	0.653
15. Healthcare workers are at a greater risk of monkeypox infection.	76 (72.4)	98 (79.0)	0.240

^aChi-square test for independence; ^bsignificance at 0.05.

Regarding open-ended questions, three emerging themes were found when asked about their major concern if there was a monkeypox outbreak, which are (1) reimplementation of nationwide lockdown, (2) impact on the economy and health, and (3) disruption to the educational system. Some of the quotes were as follows:

“The economy of the country and the income of my family will be affected. Besides, the outbreak will also affect my university life just like the COVID-19 pandemic.”

“I would be concerned of people’s well-being. Their health will be tremendously affected, and we might undergo lockdown once again which would also affect the economy as well as education.”

Most students also anticipated their face-to-face practical and clinical learning sessions to be reduced or ceased, should there be a new outbreak. Some of the quotes were as follows:

“We still can continue online class for academic learning, but for clinics session I think need to be stopped if there was a monkeypox outbreak ...”

“I expect that the learning process will be similar to when movement control order was in motion...”

“I am afraid it might affect, delay, or reduce my face-to-face practical or clinical learning sessions as WHO already declared monkeypox as a global health emergency and my academic sessions might need to be paused...”

4. Discussion

The present study evaluated preclinical and clinical dental students’ awareness, knowledge, and attitude toward the re-emerging monkeypox outbreak during the COVID-19 pandemic. Both preclinical and clinical dental students in the current study showed comparable awareness of monkeypox which may be accounted to

their previous exposure to various preventive measures designed to limit the transmission of the contagious virus during the COVID-19 pandemic[12,18]. Given the rising number of monkeypox cases since May 2022, media attention on the re-emerging outbreak during the COVID-19 has gradually escalated[8]. This may be the reason that dental students are aware of the existence of monkeypox and that it has been classified as a public health issue of global concern by the WHO.

Healthcare professionals should be adequately knowledgeable in detecting, reporting promptly, and managing incident cases to effectively curb the spread of infectious diseases. However, one of the obstacles in limiting the resurgence of infectious diseases is the persistent lack of knowledge about the disease among healthcare professionals[11]. Assessing the knowledge level of dental students regarding the emerging monkeypox viral infections during the COVID-19 pandemic can be useful in determining how well-prepared and how willing they are to work during infectious disease outbreaks as future healthcare professionals[19]. In the present study, clinical dental students showed higher satisfaction knowledge than preclinical dental students which could be attributed to the clinical exposure in their learning sessions, while preclinical is more theory oriented. The result is also in line with a previous study done among Malaysian dental students regarding their knowledge, perceived risks, and preventive behaviours amidst COVID-19 where they concluded significant differences between clinical and preclinical students[20].

Preclinical dental students demonstrated poor knowledge of pharmacology with 22.9% (24/105) of them knowing that paracetamol can be used as a treatment option for symptomatic monkeypox. This can be explained by the fact that pharmacology subjects are taught primarily in the second year of most dental curricula[21,22]. Therefore, it is conceivable that the lower level

Table 3. Attitude towards monkeypox between preclinical (n=105) and clinical (n=124) dental students.

Item	Preclinical, n (%)	Clinical, n (%)	P value ^a
1. I am concerned that the monkeypox virus will become a worldwide pandemic.			
Disagree	3 (2.9)	3 (2.4)	0.427
Neutral	20 (19.0)	33 (26.6)	
Agree	82 (78.1)	88 (71.0)	
2. I am interested to learn about monkeypox prevention and management.			
Disagree	0 (0.0)	1 (0.8)	0.003 ^b
Neutral	28 (26.7)	14 (11.3)	
Agree	77 (73.3)	109 (87.9)	
3. I am interested to learn about the epidemiology of this emerging monkeypox disease.			
Disagree	2 (1.9)	4 (3.2)	0.185
Neutral	32 (30.5)	25 (20.2)	
Agree	71 (67.6)	95 (76.6)	
4. I think that visiting a place where there is a monkeypox epidemic is dangerous.			
Disagree	2 (1.9)	3 (2.4)	0.656
Neutral	23 (21.9)	21 (17.1)	
Agree	80 (76.2)	99 (80.5)	
5. I think that the monkeypox outbreak will affect my academic learning.			
Disagree	6 (5.7)	8 (6.5)	0.976
Neutral	36 (34.3)	41 (33.1)	
Agree	63 (60.0)	75 (60.5)	
6. I think that I play a major role in preventing the outbreak of monkeypox disease as a dental student.			
Disagree	5 (4.8)	5 (4.0)	0.257
Neutral	47 (44.8)	43 (34.7)	
Agree	53 (50.5)	76 (61.3)	
7. I will use proper personal protective equipment in treating patient who is diagnosed or suspected to be infected by monkeypox virus.			
Disagree	4 (3.8)	3 (2.4)	0.177
Neutral	21 (20.0)	15 (12.1)	
Agree	80 (76.2)	106 (85.5)	
8. I am ready to receive vaccination for monkeypox disease.			
Disagree	5 (4.8)	3 (2.4)	0.406
Neutral	26 (24.8)	25 (20.2)	
Agree	74 (70.5)	96 (77.4)	
9. I think that aerosol generating procedures in dentistry might carry a risk of spreading monkeypox.			
Disagree	3 (2.9)	2 (1.6)	0.001 ^b
Neutral	47 (44.8)	27 (21.8)	
Agree	55 (52.4)	95 (76.6)	

^aChi-square test for independence; ^bsignificance at 0.05.

of knowledge on the questionnaire item may have resulted from pooling the data of the first- and second-year preclinical students. On the other hand, 27.4% (34/124) of clinical dental students were cognizant that diarrhoea could be one of the early symptoms of monkeypox, which is indicative of clinical students' inadequate comprehension of the signs and symptoms of this newly emerging disease. It is worth noting that the media coverage of the monkeypox outbreak in Southeast Asia at the time the survey was distributed is still considered minimal, which may leave the students with a lack of accurate information and more prone to spreading scepticism, conspiracies, and false news[16]. Hence, dental institutions should integrate the teaching of basic tropical medicine and infectious disease to enhance dental students' understanding of different

infectious diseases and ways to prevent future outbreaks[23]. Dental curricula should also include interim guidelines on these pandemic infectious diseases from local government and provide time-to-time updates based on recent scientific evidence and clinical experience[24].

The present study revealed that both preclinical and clinical dental students had positive attitudes towards the monkeypox outbreak. The positive attitude among dental students could be due to the previous successful experience of the country in controlling the COVID-19 outbreak[25]. Indeed, the Malaysian government reacted promptly and proactively since the beginning of the COVID-19 outbreak. Stringent measures were taken, including the implementation of movement control order, mandating wearing of facemasks and suspension of domestic and international flights to halt the infection from spreading[25]. Despite no significant difference noted in the overall attitude level between preclinical and clinical dental students, clinical dental students were found to be significantly more interested to learn about monkeypox prevention and management and agreed that aerosol-generating procedures in dentistry might carry a risk of spreading monkeypox. This can be due to the different learning experiences between preclinical and clinical dental students as clinical dental students were exposed to more patient interactions in clinical settings[26]. Due to the nature of dental education, clinical dental students are also more prone to infectious diseases that can be transmitted through aerosol-generating procedures[13].

In addition, 76.2% preclinical and 85.5% clinical dental students agreed that they will use proper personal protective equipment in treating patient who is diagnosed or suspected to be infected by the monkeypox virus. Undeniably, increased protective measures have been employed in the dental setting since the COVID-19 outbreak, such as the use of facemasks, coverall suits, and the proper donning and doffing procedures[18]. Therefore, it is reasonable to infer that these strict regulations have led to dental students' positive attitudes toward treating patients with monkeypox. Most preclinical (70.5%) and clinical dental (77.4%) students in the current study also agreed that they are ready to receive vaccination for monkeypox disease which is consistent with the findings of a previous study among Italian physicians[17]. Moreover, the present study found that only 50.5% preclinical students and 61.3% of clinical students agreed that they play a major role in preventing the outbreak of monkeypox disease. One explanation could be due to their participation during the COVID-19 pandemic. Unlike their medical and nursing peers[27,28], dental students receive less training in pandemic and disaster relief. Nonetheless, dental schools should emphasize and acknowledge dental students' involvement in halting the outspread of disease as dental practitioners played different roles at the forefront of the COVID-19 pandemic, such as swab taking, patient triaging, and monitoring of vital signs[29].

Dental students were concerned that a nationwide lockdown would be reimplemented and that the nation's economy and health would be impacted if there was a monkeypox outbreak in the country. This indirectly infers that dental students are aware of the potential repercussions if a new pandemic is proclaimed. Furthermore, dental students were concerned that a monkeypox outbreak would disrupt the educational system. The advent of the COVID-19 pandemic culminated in the suspension of traditional dental education involving students closely supervised by their teachers in clinical settings[18]. Previous studies showed that a switch to virtual or distance learning during the COVID-19 resulted in poor academic learning among dental students, with a lack of hands-on practical, weariness from virtual learning, and inadequate patient care clinical exposure as the main factors contributing to their negative learning perceptions[30,31]. Therefore, if a monkeypox outbreak occurred in the country and face-to-face practical and clinical sessions were interrupted, it is conceivable to surmise that dental students in the current study would display a poor learning perception.

Despite being the first of its kind to conduct such a survey on the monkeypox disease that emerged during the COVID-19 pandemic, several limitations are worth mentioning. First, the cause-and-effect correlations cannot be clearly defined since the present study utilised a cross-sectional study design. Second, it is crucial to consider how well the participants were able to recall their prior knowledge and experiences from the survey and their reporting styles when interpreting the findings. Third, the current study was conducted at the early stages of the monkeypox outbreak in Asia, with limited time allotted for data collection, leading to a lower number of respondents. Hence, generalisation of the current results to all dental students across the nation is not feasible. Additionally, bias in selection may have occurred because only dental students from one private dental school were selected to participate in the survey. Although one of the biggest drawbacks of content validation in a questionnaire study is the subjectivity of experts' opinions[32], construct validity and reliability of each questionnaire item were performed and analysed using *post-hoc* confirmatory factor analysis and Cronbach alpha test.

The attitude of dental students in the present study was evaluated as a subjective indicator that might not accurately reflect their comprehension of monkeypox disease. Thus, future studies with larger sample sizes involving students from different dental schools are required. Monkeypox and other newly emerging transmissible diseases should also be incorporated into dental curricula to offer dental students new perspectives and keep up with the world health issue trend. This can enhance their knowledge of emerging diseases and reflect in their practice in the near future if a new pandemic is declared. Nonetheless, the results of the current study may be insightful for research universities and public health experts in establishing the fundamental knowledge of dental students and other

healthcare professionals involved in the early prevention, diagnosis, and monitoring of this potentially dangerous infectious disease.

In conclusion, both preclinical and clinical dental students were aware of the re-emerging of monkeypox during the COVID-19 pandemic and showed positive attitudes toward it. However, clinical dental students demonstrated a higher knowledge level of monkeypox than preclinical dental students. Since complete eradication of monkeypox is unattainable, healthcare professionals' awareness, knowledge, and attitudes are essential to target transmission reduction and minimise disease burden on the community and the nation. Thus, a collaborative effort to improve dental students' understanding of this alarming outbreak is required especially during the COVID-19 pandemic. Future studies are warranted to explore and compare the present findings with students from other dental institutes as well as those in medical and health sciences.

Conflict of interest statement

The authors declare that there are no conflicts of interest.

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Authors' contributions

GSSL and WWT designed the study; GSSL, WWT and HH collected the data; DZKC, KSO and HH analysed the data; GSSL, WWT, DZKC and KSO searched the literature and wrote the manuscript; GSSL and HH edited and revised manuscript according to journal's instructions; WWT edited and controlled the final version of the manuscript. All the authors approved the final version of the manuscript.

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