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ORIGINAL RESEARCH

Medical Students' Knowledge Regarding Monkeypox: An Assessment Study

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ABSTRACT

Background: Monkeypox, a zoonotic viral disease caused by the monkeypox virus (MPXV), has historically been endemic in Central and West Africa. This study assesses the knowledge of University of Kufa medical group students about monkeypox, focusing on its etiology, transmission, clinical features, prevention, and management.

Objectives: To assess the knowledge levels of medical students at the University of Kufa regarding monkeypox and to identify relationships between students' knowledge and demographic variables.

Methodology: This descriptive cross-sectional study was conducted from September 2024 to March 2025 among 618 students from the Colleges of Medicine, Dentistry, Nursing, and Pharmacy at the University of Kufa. A stratified random sampling technique ensured proportional representation across colleges. Data were collected using a validated structured questionnaire, with a Cronbach's alpha of 0.85. The data were analyzed using SPSS (v26), employing descriptive statistics and inferential tests such as the Chi-square test.

Results: Most participants (95.1%) were aged 17–27 years, with females comprising 69.9% of the sample. While 63.4% of students had prior knowledge of monkeypox, primarily sourced from the internet and social media (77.7%), the overall knowledge level was moderate. Significant relationships were identified between students' knowledge and their gender ($p \leq 0.015$), prior knowledge, and information sources ($p \leq 0.0001$).

Conclusion: The study highlights moderate knowledge levels about monkeypox among University of Kufa students, with knowledge gaps in specific areas. Educational interventions and curriculum integration are essential to address these gaps and enhance preparedness for emerging infectious diseases. Targeted educational programs, enhanced use of digital platforms, and awareness campaigns should be prioritized.

Keywords: Monkeypox, knowledge, medical, students.

INTRODUCTION

Monkeypox, a zoonotic viral infection caused by the monkeypox virus (MPXV), was first discovered in monkeys in 1958 and subsequently found in humans in 1970 in the Democratic Republic of Congo. Since its discovery, it has predominantly been an endemic disease in Central and West Africa, with sporadic outbreaks occurring in these regions. The emergence of monkeypox outside its endemic areas, particularly in 2022, has significantly raised global awareness about the disease. The World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC) have highlighted the growing need for awareness and preparedness, as

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cases began to be reported in Europe, North America, and other non-endemic areas (WHO, 2022).

The outbreak in 2022 marked a pivotal moment in understanding the spread of zoonotic diseases, with monkeypox spreading beyond its traditional geographic limits. In fact, during this outbreak, nearly 80 countries reported cases, highlighting a change in the disease's pattern of transmission (Adler et al., 2022). This has raised important questions about the role of medical professionals in identifying, diagnosing, and managing such emerging infectious diseases. One of the critical components of this effort is ensuring that medical students are equipped with the necessary knowledge to address global health threats effectively.

Monkeypox presents with a range of clinical symptoms that include fever, chills, headache, myalgia (muscle aches), and profound fatigue. The hallmark feature of monkeypox is a characteristic rash, which begins on the face and spreads to other areas of the body. It begins as flat lesions, which eventually become raised and filled with fluid, forming pustules. These pustules eventually scab over and fall off, often leaving scars (Isidro et al., 2022). The illness typically lasts from two to four weeks, and while many cases resolve without severe complications, others may progress to more serious conditions such as secondary bacterial infections, pneumonia, or encephalitis, particularly in immunocompromised individuals (Adler et al., 2022).

As healthcare systems face the challenge of managing monkeypox outbreaks, the role of well-trained medical professionals becomes crucial. Medical students, as future healthcare providers, must be well-versed in recognizing the symptoms, diagnosing the disease accurately, and implementing effective isolation and prevention measures. However, concerns have been raised about whether medical students are adequately prepared for emerging infectious diseases like monkeypox, given the limited exposure they may have to such diseases in their training. The outbreak in 2022 has prompted renewed focus on the virus and its potential to spread rapidly in populations with limited previous exposure. While the symptoms of monkeypox are typically mild, its appearance in non-endemic regions has resulted in public health concerns, given the limited historical experience with the disease outside of Africa. This highlights the critical need for education and preparedness at the global level, particularly among healthcare providers who may encounter the disease in clinical settings.

Medical education is a key factor in ensuring that healthcare providers are prepared to manage emerging infectious diseases. Medical students are expected to develop a foundational understanding of infectious disease principles, including epidemiology, transmission dynamics, prevention, and treatment. However, the rapid emergence of new pathogens and the re-emergence of diseases previously considered rare or controlled underscore the need for medical curricula to evolve and adapt accordingly. Emerging diseases like monkeypox require medical students to be able to assess potential cases, recognize atypical presentations, and apply appropriate infection control measures.

Studies have indicated that medical students often face gaps in their knowledge regarding the management of emerging diseases such as monkeypox, largely due to the infrequency of exposure during training (Avery et al., 2021). As the COVID-19 pandemic demonstrated, healthcare workers including medical students must be able to quickly acquire knowledge and apply it in high-pressure situations. Therefore, the assessment of medical students' knowledge about monkeypox provides valuable insight into how well they are prepared for such challenges and whether medical curricula are adequately addressing these critical topics.

Medical schools can contribute to better global health preparedness by providing updated educational resources, engaging students in infectious disease research, and incorporating

practical experiences such as simulations and clinical rotations focused on emerging diseases. The significance of this research extends beyond the realm of medical education it has important implications for community health. A well-trained healthcare workforce ensures that diseases can be detected, diagnosed, and managed effectively, reducing the risk of transmission within communities and mitigating potential outbreaks. Assessing medical students' knowledge about monkeypox is an essential step in identifying knowledge gaps and improving educational programs. With the increasing threat of infectious diseases, particularly those that spread rapidly across borders, having a well-prepared medical workforce is essential to global health security. This research not only assesses the current state of medical education but also helps in shaping curricula that align with the evolving landscape of global health threats. It is a critical contribution to ensuring that medical professionals are capable of responding to outbreaks effectively and that communities are safeguarded against the public health challenges posed by diseases like monkeypox (Ibrahim& Zaghamir,2023).

AIMS OF THE STUDY

The purpose of this use study is to assess the knowledge levels of medical students at the University of Kufa regarding monkeypox and to identify relationships between students' knowledge and demographic variables.

METHODOLOGY

Study Design

This research employed a **descriptive cross-sectional study design** to assess the knowledge of University of Kufa students about monkeypox. The study design was chosen to collect data at a single point in time, providing a snapshot of the knowledge levels and their relationship with demographic factors.

Study Population

The target population consisted of students enrolled in the Colleges of Medicine, Dentistry, Nursing, and Pharmacy at the University of Kufa. These colleges were selected due to their focus on medical and health-related education, which is directly relevant to the topic of monkeypox.

Study Period

The study was conducted over a period of six months, beginning on

September 20, 2024, and concluding on March 13, 2025.

Sample Size and Sampling Technique

- **Total Population:** The total population of students in the selected colleges was **5,400**.
- Sample Size: A total of **618 students** were included in the study, representing approximately 11.4% of the total population. The sample size was determined using a standard formula for estimating proportions, with a 95% confidence level, 4% margin of error, and an assumed population proportion of 50%. Given a total population of 5,400 students in the Colleges of Medicine, Dentistry, Nursing, and Pharmacy, the minimum required sample size was calculated to be approximately 540 students after applying the finite population correction. To enhance representativeness and reliability, a slightly larger sample of 618 students (approximately 11.4% of the total population) was included using a stratified random sampling technique.
- **Sampling Method: A stratified random sampling** technique was used to ensure proportional representation from each college. The strata were defined by the colleges (Medicine, Dentistry, Nursing, and Pharmacy). Within each stratum, students were randomly selected to participate.

Inclusion and Exclusion Criteria

- **Inclusion Criteria:**
  - Students currently enrolled in the Colleges of Medicine, Dentistry, Nursing, and Pharmacy at University of Kufa.
  - Students willing to provide informed consent.

- **Exclusion Criteria**

- Students absent during the data collection period.
- Students unwilling to participate or who provided incomplete responses.

Data Collection

- **Instrument:** A structured questionnaire was developed to assess students' knowledge about monkeypox. The questionnaire consisted of two sections:

1. **Demographic Data:** Included variables such as age, gender, academic year, college of enrollment, and prior exposure to information about monkeypox.
2. **Knowledge Assessment:** Focused on key aspects of monkeypox, including its etiology, transmission, clinical features, prevention, and management.

they completed a self-administered questionnaire that took approximately 15–25 minutes to fill out. Data collection began on 10th October 2024 and ended on 2nd November 2024.

- **Validation:** The questionnaire was reviewed by a panel of experts in community health and infectious diseases for content validity. A pilot study was conducted with 30 students to test reliability, yielding a Cronbach's alpha of 0.85, indicating high internal consistency.

Instrument Reliability:

The researcher used Internal Consistency Reliability to check consistency of the measurement itself. Researcher used Cronbach's alpha to determine that. By using of Microsoft excel (2019) to fill the data, the outcome was determined by using SPSS Program (V 26) as:

Accepted value	Actual Value	Reliability Technique
> 0.7	0.8	Internal Consistency

Statistical Analysis:

Students' knowledge about monkeypox scores were calculated based on 30 questions, where true answers given a score of (2) and false answers were given a score of (1).

The following statistical data analysis approaches used in order to analyze the data of the study under application of the statistical package (SPSS) ver. (26), and the Microsoft excel (2021).

Descriptive Data Analysis

- Tables (Frequencies, and Percentages).
- Mean of scores and standard deviation.
- Cronbach's alpha to determine the reliability of the study instrument.

Inferential Data Analysis

This approach used to accept or reject the statistical hypothesis, which included Chi-square test.

RESULTS

The majority of the study sample age was between 17-27 years old (95.1%), Females (69.9%), living in urban residency area (84.5%), study in nursing collage (44.0%), most of them (63.4%) have previous knowledge about monkeypox and many of them (77.7%) reported that the internet and social media is their main source of information as shown in Table (1).

Table (2) Shows that the study sample have moderate knowledge regarding of monkeypox.

Table (4) Shows that there is statistically significant relationship between students' knowledge and their sex (P value <= 0.015). Also, there is highly significant relationship between students' knowledge and if they have previous knowledge and their source of information about monkeypox (P value <= 0.0001), while there is non-significant relationship between the remaining variables.

DISCUSSION:

A methodically structured understanding and reasonably derived discussion of study results will be presented with medical students' knowledge about monkeypox and the relationship between their knowledge and their sociodemographic data. Based on the obtained results, the majority of the study sample age is between 17-27 years old (95.1%). This is because the majority of students studying at the

university are undergraduates whose ages range between this age group. This result agrees with Islam et al., 2023 study.

Also, the majority of the students were females (69.9%). The reason may be that the majority of students in the medical group's colleges in Iraq are females, Because females get higher grades than males in preparatory school, which qualifies them to enter these colleges. This result comes along with Doan et al., 2024 findings were (62.9%)of their study sample were female. Many of the study sample live in urban residency area (87.1%). The researcher believes that this is due to the university's proximity to the city. The same result supported by Abd ElHafeez et al.,2023 results.

In the matter of collage type most of the study sample study in nursing collage (44.0%). The researcher believes that they are more interested in the research topic. Unlike the current study result most participants in Masood et al., 2023 study were medicine students. According to the collected data many of the study sample (63.4%) reported that they have previous information about monkeypox and most of this information came from internet and social media (77.7%). This is due to the Internet's popularity among students in the past years, which has provided a lot of information in various fields for everyone. These both findings match with Dabou et al., 2024 study results.

In the current study after assessing (618) students about their knowledge about monkeypox the result showed that most of them have moderate knowledge (50.2%), while (45.6%) of them have good knowledge level and only (4.2%) have poor level of knowledge. This level of knowledge is related to several factors that will be discussed later in this chapter. Also, because all the students are from the medical collages, they are most likely come across information on the subject, although there are no differences in knowledge between theses collages. Sufficient knowledge level found in Lin et al., 2022 study. While there was a knowledge gap about monkeypox found in Bakar et al., 2023 & Sallam et al., 2022 study participants

In the previously mentioned results student sex considered significant factor effecting students' knowledge level about monkeypox. As previously mentioned above, most females tend to study more than males because they devote themselves fully to studying, which qualifies them to obtain higher grades and have more time to read. Many studies found that there is non significant relationship with their sex such as Sallam et al., 2022; Mohamed et al., 2024; Dabou et al., 2024; Islam et al., 2023, While other proved the opposite result such as Abd ElHafeez et al.,2023; Masood et al., 2023; Doan et al., 2024.

Also, the study results showed that there is highly significant relationship between their knowledge and their previous information as well as their source of information. This may be obvious result, as those who have prior information about the subject have a higher level of knowledge, and this credit may go to the Internet, which has provided access to various information easily. This outcome proven by Mohamed et al., 2024 study were they found the same result.

CONCLUSIONS:

Based on the findings of this study, several key conclusions can be drawn regarding the knowledge of university students at the University of Kufa about monkeypox. The majority of the participants were between 17–27 years old, with females constituting a significant proportion (69.9%). Most participants resided in urban areas (84.5%) and were primarily students from the College of Nursing (44.0%).A substantial number of participants (63.4%) reported having prior knowledge about monkeypox, with the internet and social media identified as the primary source of information for 77.7% of respondents. Overall, the study sample exhibited a moderate level of knowledge regarding monkeypox. A statistically significant relationship was found between students' knowledge and their sex ($p \leq 0.015$). A highly

significant relationship was observed between students' knowledge and both prior knowledge and their source of information about monkeypox ($p \leq 0.0001$). No significant relationship was noted between students' knowledge and other demographic variables, suggesting that factors like age, residency, and college affiliation may not significantly impact knowledge levels in this context.

RECOMMENDATIONS:

Develop targeted educational programs aimed at improving knowledge about monkeypox among university students, particularly addressing areas where poor knowledge was identified. Integrate information about monkeypox into the curricula of health-related colleges, such as Medicine, Dentistry, Nursing, and Pharmacy, to ensure comprehensive understanding. Utilize the internet and social media platforms effectively, as they are the primary sources of information for most students, to disseminate accurate and reliable information about monkeypox. Collaborate with social media influencers and health authorities to create engaging and educational content about monkeypox. Address the knowledge gaps observed between genders by implementing gender-sensitive educational strategies to ensure equitable knowledge distribution. Conduct awareness campaigns emphasizing the prevention, symptoms, and treatment of monkeypox, targeting both urban and rural populations within the university community. Encourage students to seek information from credible sources, such as public health organizations and scientific publications. Investigate the reasons behind the variability in knowledge levels across different demographic groups and identify potential barriers to understanding. Conduct longitudinal studies to assess the impact of educational interventions and changes in knowledge over time. University administrations and public health authorities should collaborate to design policies that prioritize health education and preparedness for emerging infectious diseases like monkeypox.

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TABLES:

Table (1): Descriptive statistical analysis (frequencies and percentages) of demographic data.

Demographic Data		Freq.	%
Age	17-21 Years	588	**95.2**
	22-26 Years	24	**3.9**
	27-31 Years	6	**0.9**
Sex	Male	186	**30.1**
	Female	432	**69.9**
Residence	Urban	522	**84.5**
	Rural	96	**15.5**
College type	Medicine	110	**17.8**
	Dentistry	88	**14.2**
	Nursing	272	**44.0**
	Pharmacy	148	**23.9**
Do you have previous information about monkeypox	Yes	392	**63.4**

	No	226	**36.6**
Source of information	Study	112	**18.1**
	Internet	480	**77.7**
	TV	26	**4.2**
Total		**618**	**100**

Table (2): Frequency distribution of overall Students knowledge scale items.

Overall Items		Freq.	%	Mean of score	SD.	Assess.
Students' knowledge	Poor	26	4.2	1.55	.129	**Fair**
	Fair	310	50.2			
	Good	**282**	**45.6**			

Poor: MS <= 1.33; Fair: MS =1.34 - 1.60; Good: MS =1.61+.

Table (3): Relationship between demographic data and students' knowledge

Demographic Data		Students' knowledge			Chi-Square	D.f.	p-value
		Poor Freq.	Fair Freq.	Good Freq.			
Age	17-21 Years	26	292	270	7.176	6	**0.305 (NS)**
	22-26 Years	0	12	12			
	27-31 Years	0	6	0			
Sex	Male	14	96	76	8.409	2	**0.015 (S)**
	Female	12	214	206			
Residence	Urban	20	272	230	5.478	2	**0.065 (NS)**
	Rural	6	38	52			
College type	Medicine	6	46	58	8.785	6	**0.186 (NS)**
	Dentistry	4	42	42			
	Nursing	14	146	112			
	Pharmacy	2	76	70			
Do you have previous information about monkeypox	Yes	20	168	204	23.094	2	**0.000 (HS)**
	No	6	142	78			
Source of information	Study	8	70	34	32.871	4	**0.000 (HS)**
	Internet	16	218	246			
	TV	**2**	**22**	**2**			

P-Value <=0.05 (significant) ; p-value > 0.05 (non-significant).