ORIGINAL ARTICLE

FROM NOVICE TO EXPERT: COMPARING PUBLIC HEALTH STUDENTS' KNOWLEDGE OF MONKEYPOX AND ITS RISK PERCEPTION

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ABSTRACT

Objective: To compare monkeypox knowledge and risk perception among the public health students of various educational levels.
Study Design: Cross-sectional study.
Place and Duration of Study: Health Services Academy (HSA), Islamabad, 03 months (June to September 2023).
Methodology: A study was done at HSA, Islamabad, where 800 students of Bachelor of Science in Public Health (BSPH), Master of Science in Public Health (MSPH), and Doctorate (PhD) are enrolled. Two hundred sixty students were selected, by a stratified random sampling technique. Data were gathered by administering a questionnaire (self-developed, pre-tested). Categorisation of monkeypox(Mpox)-related knowledge was good or poor on the basis of scores (percentage). Attitude and risk perception were recorded on a Likert scale. Chi-square test evaluated the association of the educational level of the respondents with study variables.
Results: Knowledge and positive attitudes were seen to improve with advanced academic levels. Association between education level and Mpox knowledge was not significant. Those enrolled in MSPH (59.3%) showed non-significant trends (p=0.31) toward improved knowledge. Moreover, 60.7% of MSPH students had a relatively high perception of knowledge, but the difference was non-significant (p- value 0.16).
Conclusion: Specific educational interventions, involving the community and media, should be done in order to address knowledge gaps, resulting in better preparedness for Mpox outbreaks.
Key words: *Attitudes, Knowledge, Monkeypox, Perception, Public health*
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INTRODUCTION

An Orthopoxvirus causes Monkeypox (Mpox), a zoonotic disease. The affected humans were first recognised in 1970 in Congo. Once a rare infection with comparatively minimal transmission, Mpox was only found in some parts of Africa. Later, the epidemiological picture of Mpox changed substantially. Mpox cases have returned following the global issues by the COVID-19 pandemic, highlighting the need to reevaluate the threat. On May 21, 2022, the World Health Organization (WHO) reported 92 confirmed cases of Mpox in 12 non-endemic countries, along with 28 suspected cases [1]. On May 23, 2022, Pakistan's National Institutes of Health (NIH) sent out alerts about the possibility of breakouts in the region[2]. On August 9, 2022, the WHO deemed the Mpox outbreak, a worldwide health emergency [3].

The largest reservoirs for Mpox virus are the rodents, and the primary hosts are rabbits, lemmings and primates, infrequently passing it to human beings on direct contact while hunting or handling bushmeat. This virus spreads systemically after entering through damaged skin / mucous membrane. Human-to-human transmission occurs via respiratory droplets, lesion contact, or bodily fluids, though it is less efficient than airborne viruses [4]. Recent investigations have also explored the potential for sexual transmission, particularly among men who have sex with men (MSM), a pattern that has emerged in several non-endemic regions during the latest outbreak [5].

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The incubation period of the illness is 5 - 21 days, frequently with nonspecific signs & symptoms of fever, headache, chills, myalgia and lymphadenopathy, before the typical rash erupts. Lesions at different phases of the disease may be present simultaneously. Polymerase chain reaction (PCR) testing of lesion samples is the diagnostic modality of choice, given its sensitivity and specificity, whereas PCR testing of blood is less reliable due to the transient nature of viremia [6]. Management is generally supportive, with an emphasis on symptomatic relief and prevention of secondary bacterial infections. In severe cases or among high-risk populations, antiviral agents developed for smallpox, such as Tecovirimat, have been employed with some success. Mpox prevention and control strategies are diverse, requiring both individual and public health efforts [7].

CAPSULE SUMMARY

Knowledge about monkeypox disease and its risk perception among the public health students of various educational levels was compared. Knowledge and positive attitudes were seen to improve with advanced academic levels. However, the association between education level and Mpox knowledge was not significant. Specific educational interventions should be implemented to bridge the knowledge gaps, resulting in better preparedness for Mpox outbreaks.

Monkeypox causes emotional issues as well. Anxiety, misinformation and stigma can exacerbate the epidemic by deterring patients from getting treatment or collaborating with public health forums. Apprehension as well as societal pressure end up in underreporting, which makes its control arduous. Addressing these psychosocial factors requires a comprehensive approach that integrates mental health [8].

Globally, Mpox has changed from a rare disease to a health problem having notable intercontinental repercussions. Over the past two decades, outbreaks in Nigeria and sporadic cases in the United States, the United Kingdom, Israel, and Singapore have underscored the virus's potential to spread beyond its traditional geographic confines [9]. From 1st January to 30th November 2022, total 92783 verified cases of Mpox, were reported to the WHO (data from 116 countries). One hundred and seventy-one deaths were also confirmed [10].

On a regional level, Pakistan's scenario illustrates the challenges and opportunities of managing Mpox in environments with limited resources. Pakistani health officials increased surveillance and warned medical facilities after receiving early reports of cases from other countries. Despite these proactive measures, the country's healthcare infrastructure, already strained by the COVID-19 pandemic and other infectious diseases, faces significant limitations in terms of diagnostic capacity and clinical management resources [11].

The WHO has demanded the creation of regional and international collaboration that enables quick info sharing, as well as the introduction of standardised procedures for detection, laboratory confirmation and reporting. Such collaborative frameworks are critical for mounting an effective response to Mpox outbreaks and for minimizing the impact of the disease on public health systems worldwide [12].

Notwithstanding the global increase seen in the Mpox cases, there is a scarcity of local data from Pakistan, particularly regarding awareness among public health students. Moreover, assessment of the gaps in knowledge among public health professionals can help to formulate effective protocols for tackling this disease. The study was done with a purpose of finding out the Mpox knowledge, attitudes, and risk perception among Bachelor of Science in Public Health (BSPH), Master of Science in Public Health (MSPH) and Doctorate (PhD) students.

METHODOLOGY

A cross-sectional study was carried out over 03 months (15th June 23 to 15th September 2023) at the Health Services Academy (HSA), Islamabad, an academic institution with about 800 students of BSPH, MSPH, and PhD programs.

Stratified random sampling technique was utilized for the selection of participants, based on students' attendance registers, to ensure proportional representation from different academic programs. Sample size was calculated, using a 50% prevalence assumption to allow for maximum variability, resulting in an initial required sample of 260 participants.

Inclusion criteria were the students aged 18 years or above, who had completed at least one semester at the HSA. Students with serious illnesses or medical conditions that could hinder participation were excluded. Approval regarding the ethical aspects was obtained from the Institutional Review Board (IRB) of the institute.

Data were gathered through structured, direct interviews employing a questionnaire (pre-tested, adapted from the WHO's existing tool, the Centres for Disease Control & Prevention (CDC), as well as from previous peer-reviewed studies on Mpox). The questionnaire underwent expert review and structural revision to enhance clarity and logical grouping of items. To evaluate the reliability of the tool, a pilot study was done with 30 students of Public Health from the National University of Medical Sciences (NUMS). Cronbach's Alpha measured the reliability to be 0.800

The questionnaire comprised sections on sociodemographic characteristics, knowledge and risk perception of Mpox. Knowledge and Risk perception were dependent variables, while the independent variable was the level of education.

Knowledge was assessed through a series of questions covering various aspects of Mpox. Each correct response was awarded one point, with total possible scores ranging from 0 to 10. A

composite knowledge score was created by summing the correct responses. Knowledge levels were categorised as good and poor knowledge based on the total score. Scores > 5 fell in the category of good knowledge, and scores ≤ 5, of poor knowledge.

Risk perception was evaluated using a Likert scale, and responses were categorized into two groups. High-risk perception was indicated by favorable responses, and low risk perception indicated by less favorable or negative responses

Data were recorded and analysed with SPSS 26. Descriptive statistics (frequencies, percentages, means & SD) were utilized for summing up of data. Chi-Square test (χ^2) examined the association of educational levels with knowledge scores and risk perceptions. All p-values of <0.05 were taken as significant.

RESULTS

Two hundred and sixty public health students participated in this study. Participants' age range was 18 - 52 years (mean age 26.0±6.0 years). Over half (55.4%) were enrolled in MSPH program. Regarding residence, the majority (64.6%) lived in urban cities. Occupationally, students comprised the largest group (45.8%), followed by private-sector employees (25.0%). Academic year distribution showed maximum participation (47.7%) from second year (Table 1).

Table 1. Sociodemographic features of public health students (n = 260)

Age	**Mean±SD**	**Maximum**	**Minimum**
	26± 6.0	52	18
Demographics		**Frequency (n)**	**Percentages (%)**
Current education	BSPH	74	28.5
	MSPH	144	55.4
	PhD	42	16.2
Residency	Rural	26	10.0
	Urban town	66	25.4
	Urban	168	64.6
Occupation	Government employee	49	18.8
	Private employee	65	25.0
	Self-employed	11	4.2
	Unemployed	16	6.2
	Student	119	45.8
	Retired	0	0.0
	Other	0	0.0
Academic Year	1st	118	45.4
	2nd	124	47.7
	3rd	8	3.1
	4th	10	3.8
	Other	0	0.0

The majority of participants (87.3%) had heard about Mpox. However, only 27.3% correctly identified its initial discovery

Table 2. Mpox virus knowledge of participants (n = 260)

		Frequency (n)	Percentage (%)
Have you heard about the Mpox virus?	(✓)	227	87.3
	(X)	33	12.7
Do you know when Mpox was first discovered?	(✓)	71	27.3
	(X)	105	40.4
	I don't know	84	32.3
From where you obtained information about Mpox?	Social media	111	42.7
	News media	30	11.5
	Scientific articles	43	16.5
	Health care provider	34	13.1
	Family and friends	20	7.7
	Others	22	8.5
Is contact the most common method of Mpox transmission?	(✓)	202	77.7
	(X)	58	22.3
Can Mpox be transmitted from mother to child?	(✓)	138	53.1
	(X)	122	46.9
Can Mpox virus be transmitted by blood?	(✓)	114	43.8
	(X)	146	56.2
Can Mpox virus be spread through air?	(✓)	118	45.4
	(X)	142	54.6
What is the most common symptoms of Mpox virus?	Fever	32	12.3
	Rash	137	52.7
	Swollen lymph node	56	21.5
	Don't know	35	13.5%
What is the incubation period of Mpox virus?	5-21	118	45.4%
	Don't know	142	54.6%

Note: (✓) means Yes, (X) means No

date. The primary information source was social media (42.7%), followed by scientific articles (16.5%). Regarding transmission, 77.7% recognised close contact as the main route; 53.1% understood vertical (mother-to-child) transmission; 43.8% acknowledged possible blood-borne spread; and 45.4% correctly indicated that airborne transmission can occur. The most frequently cited symptom was rash (52.7%). Correct knowledge of incubation period (5–21 days) came out to be 45.4% (Table 2).

Total 51.9% participants had good overall knowledge of Mpox and a slight majority (53.8%) reported high perceived risk of Mpox (Table 3).

Table 3. Distribution of knowledge scores and risk perception levels among participants (n=260)

		Frequency (n)	Percentage (%)
Knowledge of Mpox	Good	135	51.9
	Poor	125	48.1
Perception	High	140	53.8
	Low	120	46.2

Regarding the association between current education status and knowledge category, a large number (59.3%) of MSPH students had comparatively good knowledge of Mpox among all education levels but the association was non-significant with a p-value of 0.31 (Table 4).

Table 4. Association between education level and knowledge among participants

Knowledge						
Good			Poor		Statistics	
Education level of respondents	**Frequency n=135**	**(%)**	**Frequency n=125**	**(%)**	**X^2**	**p-value**
BSPH	33	24.4	41	32.8	2.36	0.31
MSPH	80	59.3	64	51.2		
PhD	22	16.3	20	16.6		

The relationship between education levels and risk perception indicates that a large number of MSPH students (60.7%) had a significantly high perception of knowledge, with a p- value of 0.16. (Table 5).

Table 5. Association between education level and risk perception among participants (n=260)

	Perception		Statistics	
Education level	**High n(%)**	**Low n(%)**	**χ^2**	**p-value**
BSPH	36(25.7)	38(31.7)	3.61	0.16
MSPH	85(60.7)	59(49.7)		
PhD	19(13.6)	23(19.2)		

DISCUSSION

This study assessed knowledge, awareness, attitudes, as well as risk perception of the Mpox virus among 260 public health students in Islamabad. Overall, 51.9% of participants demonstrated good knowledge, while 48.1% had poor knowledge. The results indicate moderate awareness in our cohort and align with similar research in diverse populations. For example, a Saudi Arabian general population study reported that 52% of respondents had poor Mpox knowledge [13] and an Indonesian survey found that only 10% of general practitioners answered ≥80% of Mpox questions correctly [14]. In Italy, Riccò et al. (2022) observed unsatisfactory Mpox knowledge among medical professionals [8].

Factors contributing to these knowledge gaps likely include limited public health education on rare zoonoses, insufficient coverage in academic curricula, and variability in regional exposure to Mpox outbreaks. In Saudi Arabia, for instance, low case numbers and minimal local media coverage contributed to public unfamiliarity with Mpox [15]. Conversely, a Bangladeshi study reported 63.6% of students with good Mpix knowledge, suggesting that regional educational efforts can yield higher awareness [16].

Within our sample, educational attainment correlated with knowledge levels. MSPH and PhD students demonstrated higher knowledge scores than BSPH students, mirroring findings in other contexts found that clinical dental students in Malaysia had greater understanding of emerging infections than their preclinical counterparts[17]. Similarly, a study reported variable Mpox awareness among Kuwaiti healthcare workers by professional category [18]. In another study Jordanian medical students outperformed non-medical peers in Mpox knowledge and held fewer conspiracy beliefs [19]. These patterns underscore the role of advanced training, research exposure, and specialized curricula in deepening comprehension of infectious diseases.

Risk perception in our study was similarly influenced by educational level. Among MSPH students, 60.7% reported high perceived risk of Mpox was significantly more than BSPH students, of whom only 25.7% reported high risk perception. This trend echoes studies in Saudi Arabia where clinicians with advanced degrees or targeted training exhibited greater risk awareness toward emerging infections [20,21]. Enhanced risk perception among highly educated groups likely reflects greater familiarity with disease severity and transmission dynamics, as well as stronger engagement with evidence-based information sources.

The main sources of Mpox information in our sample were social media (42.7%), research papers (16.5%), and the healthcare community (13.1%), highlighting the need for accurate, authoritative messaging across channels. Social media's dominant role suggests that public health campaigns must leverage these platforms while ensuring content reliability. Healthcare curricula should also incorporate risk

communication along with behavioral science to prepare students for future community health crises.

LIMITATIONS

A cross-sectional design and focus on a single institution might have limited generalizability. Moreover, self-reported data can have recall /social desirability bias. Research with longitudinal designs across multiple universities and qualitative methods to explore underlying reasons for knowledge gaps and perceptions should be undertaken.

CONCLUSION

Higher education alone might not affect the knowledge/ perception of newer diseases. Cohesive awareness strategies should be employed for early diagnosis and coordinated strategies that are vital for future alertness and response to any outbreaks.

ETHICAL APPROVAL: *Reference number: F.No.000265/HSA/ MSPH-2021, Date: 02-05-2023*
CONSENT FOR PUBLICATION: *Written, informed consent was obtained from the study participants.*
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AUTHORS' CONTRIBUTION

- ***Paras Shaikh:*** *Conception and design, Acquisition of data, Aanalysis and interpretation of data, Drafting the article*
- ***Ejaz Ahmad Khan:*** *Aanalysis and interpretation of data, Critical revision, Drafting the article*
- ***Aysha Mushtaq:*** *Conception and design, Acquisition of data, Aanalysis and interpretation of data*
- ***Saqib Khan:*** *Aanalysis and interpretation of data, Critical revision*
- ***Samia Sheikh:*** *Acquisition of data, Critical revision*

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