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Coronavirus Pandemic

Post COVID attitude, intent, awareness and preparedness of public to combat monkeypox infection in Odisha state, India

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Abstract

Introduction: The coronavirus disease 2019 (COVID-19) pandemic highlighted the importance of public knowledge, vaccination, government preparedness, and a strong healthcare system in managing infectious diseases. Recently, monkeypox (mpox) cases have emerged globally. This study aimed to assess: (i) the public knowledge related to COVID-19 and its translation into preventive behavior, and (ii) the preparedness of the government and healthcare providers in addressing mpox.

Methodology: An online survey was conducted among the adults in Odisha, India. Data were analyzed using SPSS version 26.

Results: Most participants recognized mpox as a viral infection transmitted between animals and humans. Awareness of its cause and symptoms was generally good. However, knowledge about vaccine availability and treatment was limited. The COVID-19 experience positively influenced attitudes toward vaccination, trust in the World Health Organization (WHO) guidance, preventive behavior, and digital health adoption. Despite this, participants felt that the government's response to mpox lacked sufficient preparedness.

Conclusions: These findings highlight gaps in awareness and government readiness. They emphasize the need for stronger preventive strategies to avoid future epidemics or pandemics.

Key words: digital health; vaccine acceptance; prevention; intention; knowledge; preparedness.

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Introduction

Monkey pox (mpox) is a viral infection affecting both humans and animals [1,2]. Mpox was first detected in monkeys in 1958 [3]. The virus was first detected in humans in Central Africa in 1970 [4–6]. It can transmit from animal to animal, from animal to human, and between humans [7–9]. Mpox was previously endemic to Central and West Africa, but it has spread to other parts of the world due to global migration of people [10–12]. A few cases of mpox infection were recently reported from various parts of India, and they were attributed to the virus's rapid evolution [13]. This virus and its spread had been neglected previously, but is now gaining attention of public and healthcare providers worldwide [13].

The recent coronavirus disease 2019 (COVID-19) pandemic caused great suffering, and loss of human lives. The rapid spread of the COVID-19 infection could be attributed to mere negligence by the healthcare authorities who initially did not take the infection seriously, suppression of information, and/or lack of communication in certain countries; and this lead to a global pandemic situation. Artificial intelligence and machine learning systems could have been used to monitor and reduce the gap in digital health adoption by geriatric patients [14]. The level of knowledge among healthcare workers is crucial in reducing anxiety and prevention of infection [15]. The wide variation in awareness and perceptions of the long-term COVID-19 symptoms has been reported earlier [16].

Early public awareness may facilitate future disease control efforts by public health authorities [17]. COVID-19 misinformation spread to the public through the internet [18]. As a result, there was reduced

willingness to take the COVID-19 vaccine during the low-risk pandemic periods [19]. Reports have highlighted the low adherence to COVID-19 preventive measures among the population in Spain [20], and the poor COVID-19 preparedness in communities around the world [21]. The global interest in COVID-19 preventive measures was low during early phase of the pandemic [22].

The global experience during the COVID-19 pandemic demonstrated that awareness is crucial for early prevention of any infection. Global cooperation in exchanging data and ideas for facing an emergency situation in a timely manner is important at all stages of global response. This study was conducted to assess the impact of the COVID-19 pandemic on the level of knowledge and understanding of the public in terms of applying preventive measures, as well as the level of preparedness of the Government and healthcare providers to combat and contain similar and new emerging viral infections, including mpox, in the future.

Methodology

Study instrument

A study questionnaire containing 31 questions (4 for demographics; and 9 each for knowledge, intent and preparedness) was developed following a literature review; and in consultation with doctors, pharmacists, and nurses. The response for the items other than the demographics questions were 'yes', 'no', and 'don't know'. The questionnaire and questions were pre-tested on 30 individuals using the Cronbach's Alpha value to test its validity, and suitable modifications were made to prepare the final version of the study questionnaire.

Table 1. Demographics of the study participants.

Characteristics	n	%
Gender		
Male	250	54.9
Female	205	45.1
Age (years)		
18–25	373	82.0
26–30	28	6.2
31–50	41	9.0
Above 50	13	2.9
Education		
Below high school	5	1.1
High school	11	2.4
Intermediate	100	22.0
Graduate	251	55.2
Post graduate	88	19.3
Profession		
Health related	96	21.1
Other	35	7.7
Student health related	232	51.0
Student other	92	20.2

Sample size

The sample size was determined using the Raosoft online tool considering a 5% error margin, 95% confidence level, and 50% response distribution.

Inclusion and exclusion criteria

Any individual above 18 years of age and willing to participate was included in the study. Individuals below 18 years of age, not willing to participate, and those who responded partially were excluded from the study.

Sampling method

The instrument was circulated among the eligible participants through Google form via 'Whatsapp' and email. The study was conducted during the period from March to July 2024.

Data analysis

The responses were collected using an Excel sheet and incomplete responses were deleted. Descriptive statistics was applied on the data using SPSS statistical software, version 26 (IBM Corp, Armonk, NY, USA). The data were presented as percentage and frequency. Analysis of variance (ANOVA) was applied on the responses to observe the differences in opinion with respect to age, education, and profession. A p value ≤ 0.05 was considered as statistically significant. The knowledge score of the participants were calculated for items in the knowledge section. A score of + 1 was assigned for each correct response, and a score of – 1 was assigned for each incorrect response. These scores were added to calculate the total score. Half of the maximum possible score was considered equivalent to 10 points, and the score for each item was calculated and graded as very good (> 5 points), poor (< 2.5 points), and satisfactory (2.5–5 points).

Results

A total of 480 responses were received from the participants, and 455 responses were finally considered for the study after removing the incomplete responses. Although the number of male participants was slightly higher, there was only a difference of 10% from females. The highest numbers of the participants (82%) were in the age group 18–25 years, and the lowest number (2.9%) of participants were in the age group > 50 years. Most of the participants were graduates, and the group with education below high school (high school dropout) had the lowest number of participants. In terms of profession, 51% of all participants were students of health sciences (medical, pharmacy and nursing). The data is summarized in Table 1.

Discussion

Around half of the participants were aware that mpox is prevalent in India, which is contradictory to the report of the National Center for Disease Control, India [23]. Among the participants, 80% knew that mpox is a viral infection, 70% said that it is transmitted from human to human, and 42.6% knew that it is transmitted through the bites of infected monkeys. This observation is similar to earlier studies reported from Nepal and Pakistan, and these responses can be attributed to participants from a health-related occupation [24,25]. Around 44% of all participants felt that mpox had been imported by travelers from South America and Europe, which is in line with an earlier report suggesting that travel plays an important role in mpox transmission [26]. Among the participants, 44.6% had the opinion that mpox has symptoms similar to smallpox and 42.2% had the opinion that the symptoms were similar to chickenpox. More than half of the participants agreed that the early signs and symptoms of mpox are similar to flu. Other symptoms of mpox include papules, pustules, and vesicles on the skin; and nearly 30% of the participants were not aware about these symptoms. There was almost equal distribution of the responses "yes'', "no'' and "don't know'' to the question about 'diarrhea as one of the symptoms of human mpox,

Table 2. Public knowledge and intent, and preparedness of the government.

Questions	Response					
	Yes		No		Don't know	
	N	%	N	%	N	%
Knowledge						
6. Is mpox prevalent in India?	211	46.4	104	22.9	140	30.8
7. Is mpox a viral infection?	366	80.4	30	6.6	59	13.0
8. Is mpox a bacterial disease infection?	140	30.8	225	49.5	90	19.8
9. Is mpox easily transmitted human-to-human?	320	70.3	57	12.5	78	17.1
10. Could mpox be transmitted through a bite of an infected monkey?	194	42.6	140	30.8	121	26.6
11. Are travellers from South America and Europe the primary source of imported cases of mpox?	197	43.3	73	16.0	185	40.7
12. Do mpox and smallpox have similar signs and symptoms?	203	44.6	123	27.0	129	28.4
13. Do mpox and chickenpox have similar signs and symptoms?	192	42.2	140	30.8	123	27.0
14. Is a flu-like syndrome one of the early signs or symptoms of human mpox?	240	52.7	66	14.5	149	32.7
15. Are rashes on the skin one of the signs or symptoms of human mpox?	302	66.4	48	10.5	105	23.1
16. Are papules on the skin one of the signs or symptoms of human mpox?	271	59.6	51	11.2	133	29.2
17. Are vesicles on the skin one of the signs or symptoms of human mpox?	236	51.9	59	13.0	160	35.2
18. Are pustules on the skin one of the signs or symptoms of human mpox?	234	51.4	57	12.5	164	36.0
19. Is diarrhea one of the signs or symptoms of human mpox?	168	36.9	135	29.7	152	33.4
20. Is lymphadenopathy (swollen lymph nodes) one clinical sign or symptom that could be used to differentiate between mpox and smallpox cases?	204	44.8	56	12.3	195	42.9
21. Are people who received the chickenpox vaccine immunized against mpox?	129	28.4	175	38.5	151	33.2
22. Is there a specific vaccine for mpox?	189	41.5	131	28.8	135	29.7
23. Is there a specific treatment for mpox?	182	40.0	149	32.7	124	27.3
Intent						
5. Acceptance to mpox vaccine has increased after the COVID-19 pandemic?	368	80.9	87	19.1	0.0	0.0
24. The COVID-19 pandemic has shifted the public to more reliable sources of information such as the World Health Organization (WHO)	282	62.0	85	18.7	88	19.3
25. Intention of adherence to preventive measures for mpox has improved after the COVID-19 pandemic?	269	59.1	71	15.6	115	25.3
26. Has the public learned to become more aware about mpox after the COVID-19 pandemic?	283	62.2	76	16.7	96	21.1
29. Has the perception of public (prevention is better than cure) increased after COVID-19 pandemic?	169	37.1	87	19.1	199	43.7
Preparedness						
27. Is the government more proactive in creating awareness about mpox after the COVID-19 pandemic?	159	34.9	170	37.4	126	27.7
28. Is the government more proactive in taking preventive measures for mpox after the COVID-19 pandemic?	181	39.8	60	13.2	214	47.0
30. Are healthcare providers well prepared to combat mpox infection after the COVID-19 pandemic?	197	43.3	81	17.8	177	38.9
31. Has the adoption of digital health improved after the COVID-19 pandemic?	270	59.3	89	19.6	96	21.1

similar to findings from earlier reports from the Arabic region [27]. There was almost equal distribution of the responses "yes'' and "don't know'' to the question about 'lymphadenopathy as one clinical sign or symptom that could be used to differentiate between mpox and smallpox cases', which has not been reported earlier. Nearly 38.5% said "no" and 33.2% say "don't know'' in response to the question regarding 'people who got vaccinated for chickenpox would be protected also to mpox'. This shows that more than half of our participants were somehow confident that these viruses are unrelated and vaccines cannot provide cross protection; and this has not been reported in earlier studies. Around 40% said "yes'' and 30% said "don't know'' when asked if there was any specific treatment and vaccine for mpox, and this response was similar to findings from an earlier study conducted in Pakistan [25]. The data is summarized in Table 2.

The final knowledge score of the participants was satisfactory or good for more than half of the items. Around 60% of the participants said that the acceptance to mpox vaccine [28], and the adherence to preventive measures, increased after the COVID-19 pandemic. This could be attributed to the impact of the quick surge in COVID-19 cases [29]. Additionally, the public has now turned to more reliable sources of information, such as the World Health Organization (WHO); although this observation is not supported by a study from Nepal [24] (Table 2).

There are several reports advocating the use of digital health solutions to close the gap to be able to meet the healthcare needs of all patients during the

Table 3. Analysis of variance (ANOVA) of the survey responses.

	Age		Education		Profession	
	F	Sig	F	Sig	F	Sig
5. Has the acceptance of mpox vaccine increased after the COVID-19 pandemic?	3.582	0.014	2.762	0.027	1.194	0.312
6. Is mpox prevalent in India?	2.636	0.049	0.541	0.706	1.651	0.177
7. Is mpox a viral infection?	1.535	0.205	2.222	0.066	4.678	0.003
8. Is mpox a bacterial disease?	1.689	0.169	3.140	0.015	4.148	0.006
9. Is mpox easily transmitted human-to-human?	0.686	0.561	1.932	0.104	1.278	0.281
10. Could mpox be transmitted through a bite of an infected monkey?	1.054	0.368	2.910	0.021	0.728	0.536
11. Are travellers from South America and Europe the primary sources of imported cases of mpox?	0.250	0.862	0.806	0.522	2.951	0.032
12. Do mpox and smallpox have similar signs and symptoms?	0.694	0.556	3.064	0.016	2.385	0.069
13. Do mpox and chickenpox have similar signs and symptoms?	1.463	0.224	2.511	0.041	2.919	0.034
14. Is a flu-like syndrome one of the early signs or symptoms of human mpox?	1.707	0.165	2.029	0.089	4.841	0.003
15. Are rashes on the skin one of the signs or symptoms of human mpox?	0.865	0.459	2.561	0.038	3.331	0.019
16. Are papules on the skin one of the signs or symptoms of human mpox?	1.387	0.246	1.477	0.208	1.761	0.154
17. Are vesicles on the skin one of the signs or symptoms of human mpox?	0.801	0.494	2.738	0.028	3.584	0.014
18. Are pustules on the skin one of the signs or symptoms of human mpox?	0.404	0.750	4.993	0.001	3.298	0.020
19. Is diarrhea one of the signs or symptoms of human mpox?	0.265	0.850	2.943	0.020	0.943	0.420
20. Is lymphadenopathy (swollen lymph nodes) one clinical signs or symptoms that could be used to differentiate between mpox and smallpox cases?	1.598	0.189	1.717	0.145	3.285	0.021
21. Are people who recieved the chickenpox vaccine immunized against mpox?	1.432	0.233	2.378	0.051	0.638	0.591
22. Is there a specific vaccine for mpox?	1.447	0.229	1.942	0.102	0.557	0.644
23. Is there a specific treatment for mpox?	1.978	0.117	1.382	0.239	0.993	0.396
24. Has the COVID-19 pandemic shifted the public to more reliable sources of information such as the WHO?	1.896	0.129	2.107	0.079	3.525	0.015
25. Has the intention of adherence to preventive measures for mpox improved after the COVID-19 pandemic?	0.795	0.497	2.773	0.027	2.617	0.051
26. Has the public learned to become more aware about mpox after the COVID-19 pandemic.	0.297	0.827	1.457	0.214	1.754	0.155
27. Is the government more proactive in creating awareness about mpox after the COVID-19 pandemic?	2.400	0.067	2.843	0.024	3.903	0.009
28. Is the government more proactive in taking preventive measures for mpox after the COVID-19 pandemic?	1.373	0.250	1.934	0.104	6.125	0.000
29. Has the perception of public (prevention is better than cure) increased after the COVID-19 pandemic?	4.489	0.004	4.220	0.002	10.478	0.000
30. Are healthcare providers well prepared to combat mpox infection after the COVID-19 pandemic?	1.263	0.287	2.880	0.022	5.906	0.001
31. Has the adoption to digital health improved after the COVID-19 pandemic?	0.617	0.604	1.885	0.112	2.860	0.037

F: F value; Sig: significance.

COVID-19 pandemic [30–32]. In this study, 59.3% of participants opined that the adoption to digital health has improved after the pandemic, and this has not been reported earlier. Several reports have emphasized the urgency to become proactive in taking preventive measures to avoid another COVID-19 like pandemic situation [33–35]. However, in this study only 43.3% felt that healthcare providers were well prepared to combat mpox infection; and nearly 35% of the participants believed that the Government is more proactive, after the pandemic, in creating awareness and taking preventive measures for mpox and/or learning from the COVID-19 pandemic.

Statistical analysis

The reliability of the study instrument was evaluated by determining the Cronbach's alpha value. The alpha value was 0.907 indicating excellent internal consistency of the instrument. The results of the ANOVA analysis are provided in Table 3.

Significant differences of opinion about the increasing acceptance of mpox vaccine after the COVID-19 pandemic were noted among different age and education groups. However, no such differences of opinion were observed in response to questions about 'mpox being easily transmitted between humans', 'papules on the skin being one of the signs', 'vaccination for chickenpox providing immunity to mpox', 'if there was a specific vaccine and treatment for mpox', and 'COVID-19 pandemic made the public more aware of mpox'. There was no significant difference of opinion between the groups in the belief that the experience of the COVID-19 pandemic highlighted that prevention is better than cure.

A significant variation of opinion was noted between certain age groups when responding to the question on 'mpox is prevalent in India'; whereas a significant variation of opinion among different professional groups was noted for questions such as 'mpox is a viral infection with early flu-like signs and symptoms', and 'COVID-19 pandemic has made the government more proactive to take preventive measures and improved the adoption of digital health'.

Another significant difference of opinion was observed between different professional and educational groups in response to the question 'is mpox a bacterial infection'.

A significant difference of opinion was noted between educational groups regarding the question 'is mpox transmitted through bite of infected monkey', and 'is the intention of adherence to preventive measures for mpox improved after the COVID-19 pandemic'.

Significant differences of opinion were also observed between professional groups in the case of questions such as 'travelers from America and Europe are the primary source of imported cases of mpox', 'diarrhea and lymphadenopathy are the signs or symptoms of human mpox', 'COVID-19 pandemic has shifted the public to more reliable sources of information like WHO'. A significant difference of opinion was noted between different educational groups in the case of questions such as 'mpox and smallpox have similar signs and symptoms'.

Finally, significant differences of opinion were observed between different educational and professional group for questions such as 'mpox and chickenpox have similar signs and symptoms'; 'rashes, vesicles, and pustules on the skin are among the signs or symptoms of human mpox'; 'COVID-19 pandemic has made the government more proactive in creating awareness'; and 'healthcare workers are well prepared to face an mpox outbreak'.

Conclusions

The knowledge of the participants concerning mpox infection, transmission, and preventive measures was found to be satisfactory. The findings are possibly related with the significant impact of the COVID-19 pandemic on the acceptance of vaccines, a shift to reliable sources of information such as WHO, and participants' intention of adherence to preventive measures. However, the participants did not feel any better or satisfied with the impact of the government's preparedness to combat mpox cases or the spread of the disease in the case of an outbreak. It seems that the COVID-19 pandemic has improved the adoption of digital health. In addition, there are indications that the government has not learned any lessons from the COVID-19 pandemic. The findings of this study offer some insights and may act as a wakeup call for the government to improve their approach, develop new strategies and policies, strengthen the surveillance, and initiate a preventive program that will aim to better prepare for any emergency situation in the future.

Limitation of the study

The study and its findings are limited to the adult population of Odisha, India. The findings should be seen as a snapshot in time and cannot capture changes in attitudes or preparedness over time, and should be treated as such.

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Conflict of interests
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