


# Assessment of risk perception and subjective norms related to Mpox (monkeypox) among adult males in Bangladesh: A cross-sectional study

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## Abstract

**Background and Aims:** Monkeypox (Mpox) has become a concern worldwide after spreading into nonendemic countries. The World Health Organization (WHO) has declared this a public health emergency of international concern and recommended to get vaccinated first who are at the highest risk. Risk perception and subjective norms can influence the decision of vaccine uptake. Therefore, we intended to perform a cross-sectional study on the male population in our country to assess their risk perception and subjective norms on Mpox.

**Methods:** We measured participants' risk perception and subjective norms using Google form. Demographic profile of participants was obtained using a structured questionnaire. We performed a  $\chi^2$  test to compare the levels of risk perception and subjective norm perception and multiple logistic regression analysis to determine the association between the study parameters and the sociodemographic profile of the participants.

**Results:** Among the participants, 93 (23.72%), 288 (73.47%), and 11 (2.81%) had high, medium, and low-risk perceptions, respectively. For subjective norms, we observed 288 (58.16%) participants had a medium, 117 (29.85%) had high, and 47 (11.99%) had low levels of subjective norms, respectively. Most participants possessed medium risk perception (73.47%) and subjective norms (58.16%). Moreover, we observed that moderate risk perception was prevalent in people with body mass index (BMI) level between 18.5 and 25 (73.3%), married (63.5%), low economic background (94.1%), living with a family (77.1%), smokers (68.4%), heterosexuals (99%), people with no/little impact of coronavirus disease 2019 (Covid-19) on life (91%). Proportions of people with moderate subjective norms BMI level of 18.5–25 (73.2%), married (60.5%), low economic status (93.9%), rural

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(58.8%), living with family (77.2%), nonsmokers (71.1%), and people with no/little impact of Covid-19 in their lives (91.2%).

**Conclusion:** The majority of participants perceived medium risk perception and subjective norms related to Mpox. Furthermore, we observed a significant association between the study parameters and the sociodemographic characteristics of our study participants. We recommend that further longitudinal studies to yield more accurate results.

#### KEYWORDS

Mpox, monkeypox, poxviridae, poxviridae infections, risk perception, subjective norms

## 1 | INTRODUCTION

Mpox (monkeypox) is a rare zoonotic viral disease, and the etiological agent behind it is the Mpox virus (MPV) of the Poxviridae family.<sup>1</sup> The Mpox disease is not new, as the first case was detected in 1970, although the MPV was discovered in 1958.<sup>2,3</sup> In 2003, the United States became the first nonendemic country to witness a few Mpox cases.<sup>4,5</sup> However, a massive outbreak of Mpox has been observed this year, and considering the worldwide situation the World Health Organization (WHO) recognized the recent Mpox outbreak as a public health emergency of international concern on July 23, 2022.<sup>6</sup> According to the data reported by Centers for Disease Control and Prevention (CDC), there are a total of 84,075 cases and 75 confirmed deaths of Mpox as of January 4, 2023.<sup>7</sup> Although Mpox is not a novel disease, there have been a few variations between this outbreak and the prior one. In the current incidence, gays, bisexuals, and men in intimate relationships with other men are the most affected by the MPV, whereas children were the most vulnerable during the last outbreak.<sup>8</sup> A few symptoms of the current Mpox disease outbreak, such as rectal pain, swollen penile, and solitary and tonsil lesions, differ from those of the previous one. Recent cases reported genital lesions as a symptom of Mpox infection, indicating that sexual intercourse can be a route for virus transmission since it involves intimate contact with sexual partners. In the recent outbreak, the infected individuals have no history of traveling to endemic regions except one, which suggests the community spreading of the disease.<sup>9–11</sup>

The new type of ongoing Mpox cases and the rising number of infected people and fatalities emphasize the importance of having a thorough understanding of the Mpox disease, including its symptoms, mode of transmission, risk factors, and prevention methods before it turns out to be a pandemic. After the worldwide reemergence of Mpox and its declaration as a public health emergency, a few studies have been conducted to measure the magnitude of knowledge about Mpox among the general population and healthcare professionals. Alshahrani et al. conducted a survey study on the Saudi people to assess their knowledge level about Mpox and found that the study population had a slightly poor idea about this disease.<sup>12</sup> A study performed on Italian adults revealed that most participants were

unaware of Mpox, and almost half showed hesitancy toward Mpox vaccination.<sup>13</sup> Zheng et al. observed that homosexuals and bisexuals had lower knowledge about the susceptible population, the symptoms, vaccines, and treatment of Mpox after conducting a cross-sectional study on men who have sex with men (MSM) individuals.<sup>14</sup> Other studies also explored an alarming gap in knowledge and unpreparedness about the Mpox outbreak.<sup>15,16</sup> One common challenge represented by all these studies was the lack of knowledge about Mpox.

Vaccination is believed to be the best preventive approach against Mpox infection.<sup>17</sup> The WHO suggests that gays, bisexuals, MSM, laboratory employees, and health professionals should get vaccinated first since they are at the highest risk of Mpox infection.<sup>4</sup> Several factors including risk perception and subjective norms, influence attitudes toward preventive behavior.<sup>18</sup> Previous studies imply that individual risk perception had a role in the success of vaccination programs.<sup>18</sup> A few studies regarding the Mpox outbreak revealed that people with increased risk perception had a positive association with vaccine acceptance. Risk perception has been one of the significant predictors of vaccination intentions. Subjective norms have also an impact on the decision of vaccine uptake.<sup>19–24</sup> So, individual risk perception and subjective norms are critical predictors of vaccination decisions against Mpox. Since the current Mpox disease is more likely to affect young, middle-aged males,<sup>25,26</sup> it is essential to know about their perception of risk and subjective norms related to Mpox, which would provide insight into their decision on vaccination if in future any vaccination program against Mpox infection is recommended. Therefore, we aimed to conduct this cross-sectional survey on the male population to assess their risk perceptions and subjective norms, which will considerably contribute to combating this new emerging threat.

## 2 | METHOD

### 2.1 | Study design and participants

This study was a cross-sectional survey-based online study, recruiting all male participants from various parts of our country. Before data

collection, we determined the minimum sample size considering the confidence level, and error level, and standard deviation as 95%, and 5%, 0.5, respectively. According to our estimation, this study required a minimum of 385 participants to attain 80% statistical power. Our study included only native male participants with an age limit of 18–45 years and had an access to the internet. We excluded participants who were under the age of 18 years and submitted partial or incomplete responses. We sought permission from each participant before collecting the information from them.

Sample Size Calculation:

$$N = z^2 \times \text{Standard Deviation} \times (1 - \text{Standard Deviation}) / (\text{Margin of error})^2 = (1.96)^2 \times 0.5 \times 0.5 / (0.05)^2 = 384.16.$$

## 2.2 | Data collection procedure

We collected the responses from the participants from September 1, 2022 to November 30, 2022 by providing them with an online Google form through Email, WhatsApp, and Facebook Messenger. We designed this self-administered questionnaire for this study. The questionnaire was written in English and translated into Bangla for a better understanding. Before the main study, we performed a pilot study on a small group (10%) of participants to ensure the reliability and validity of the responses gathered from the participants. Our targeted sample size was 385. Therefore, we invited 1600 people to participate in this study and received almost a 25% response rate of about 392 participants. We sent follow-up reminders to our participants to achieve a better response rate. Completing this form required only 10 min, and the introductory statement of the questionnaire mentioned our purpose behind this study.

## 2.3 | Study parameters

### 2.3.1 | Sociodemographic characteristics

The first section of the questionnaire consisting of 18 questions, was designed to gather general information about the participants. The variables were age, sex, body weight and height, marital status, education level, occupation, monthly income, residence area, living condition, smoking habit, sexual preference, and the number of sexual partners they had. In addition, we asked participants if they or any of their family members were from healthcare professions. There were also questions about the impact of the coronavirus disease 2019 (Covid-19) outbreak on them or their family members.

### 2.3.2 | Assessment of risk perception

Disease risk perception is an individual judgment and assessment of health risks that might cause a short or long-term impact on life. This section contains six questions designed to assess risk perceptions of

Mpox disease. We requested participants to respond to a series of facts, such as the disease mortality rate, the transmission of MPV among family members or colleagues, and the possibility of Mpox infection during concentrated or self-isolation, by selecting one of five possible answers to the Likert scale, ranging from totally disagree to agree. We evaluated the participant's risk perception on a score of 0–24 and classified them as having low, medium, and high-risk perceptions with scores of below 9, 9–16, and above 16, respectively.

### 2.3.3 | Assessment of subjective norms

Subjective norms refer to a person's beliefs and engagement on a specific matter where others agree or disagree. In this section, we set the questions to measure the participant's beliefs about the impact of any family member or colleague in receiving the Mpox vaccination. We assessed the participants with three items by the mean of the score from 0 to 12, and the participants were categorized as having high (score Above 8), medium (score 5–8), and low (score below 5) levels of subjective norms.

## 2.4 | Statistical analysis

After collecting participants' responses, we compiled all these survey answers in Excel and completed data sorting and coding. We used SPSS version 25 for our data analysis. We performed descriptive statistics to measure our main study variables, such as participants' sociodemographic characteristics, risk perceptions, and subjective norms associated with Mpox. The correlations between categorical variables were identified using the  $\chi^2$  test. We did multiple logistic regression analyses to determine the influence of the scores of the study parameters on the probability of possessing low, medium, and high levels of risk perceptions, and subjective norms. In all tests, a  $p$  value of less than 0.05 was considered statistically significant.

## 2.5 | Ethics Approval Statement

The protocol was approved by the Research Ethics Committee, University of Asia Pacific, Dhaka, Bangladesh (Ref: UAP/REC/2022/109(S)). We conducted this study following the principles stated in the Declaration of Helsinki. Also, we obtained informed electronic consent from all the participants.

## 3 | RESULTS

### 3.1 | Sociodemographic profiles among the respondents

We included all sociodemographic characteristics in Table 1. Overall, 392 participants provided consent and completed the survey. Out of

**TABLE 1** Distribution of sociodemographic profiles among the respondents.

Total, N = 392	
Demographic characteristics	Distributions, % (n)
Age range (years)	
18–25	38.3 (150)
26–35	40.8 (160)
36–45	20.9 (82)
BMI (kg/m <sup>2</sup> )	
Below 18.5	7.4 (29)
18.5–25	73.2 (287)
Above 25	19.4 (76)
Marital status	
Unmarried	41.3 (162)
Married	58.7 (230)
Education level	
Illiterate	9.2 (36)
Primary	12.8 (50)
Secondary	23.7 (93)
Higher Secondary	36.2 (142)
Graduate/above	18.1 (71)
Occupation	
Service	46.2 (181)
Business	14.0 (55)
Self-employed	12.5 (49)
Student	16.8 (66)
Unemployed	3.1 (12)
Others	7.4 (29)
Economic status	
Low	94.6 (371)
Medium	4.6 (18)
High	0.8 (3)
Residence	
Urban	45.9 (180)
Rural	54.1 (212)
Living status	
With family	75.3 (295)
Without family	24.7 (97)
Smoking habit	
Smoker	32.7 (128)
Nonsmoker	67.3 (264)
Sexual orientation	
Heterosexual	98.2 (385)

**TABLE 1** (Continued)

Total, N = 392	
Demographic characteristics	Distributions, % (n)
Bisexual	1.0 (4)
Homosexual	0.8 (3)
Sexual partner	
None	39.3 (154)
One	54.6 (214)
More than one	6.1 (24)
Covid-19 impact on life	
Yes	9.7 (38)
No	90.3 (354)

Abbreviations: BMI, body mass index; N, number.

them, the maximum number of respondents 160 (40.8%) were in the age range of 26–35, and the least number 82 (20.9%) were in the 36–45 age group. Among all the participants, 287 participants accounting for 73.2% of the total participants, were at 18.5–25 BMI level, and 230 (58.7%) participants were married. Most participants 142 (36.2%) received higher secondary education, and 371 (94.6%) of participants had a lower economic status. Out of all the respondents 295 (75.3%) of participants living with family, and 212 (54.1%) of the total respondents were from rural areas. The maximum number of the participants were heterosexual, and 214 (54.6%) participants had one sexual partner, while 24 respondents (6.1%) had more than one sexual partner. Out of all the respondents, 264 (67.3%) were nonsmokers, and 354 (90.3%) of participants had no impact of COVID-19 on their lives.

### 3.2 | Association between the level of Mpox risk perception and sociodemographic profiles

The average score of risk perception in all participants were 13.15 in a scale of 0–24. We presented the association between the level of Mpox risk perception and sociodemographic profiles of the respondents in Table 2. We observed a significant association between different levels of risk perceptions about Mpox and sociodemographic characteristics, as shown in Table 2. The proportions of participants with high-risk perception were higher in (i) the age range of 18–25 versus 36–45 (50.5% vs. 15.1%,  $p < 0.05$ ), (ii) people with a BMI level between 18.5 and 25 versus below 18.5 (76.3% vs. 9.7%,  $p < 0.05$ ), (iii) married people versus unmarried (52.7% vs. 47.3%,  $p < 0.05$ ), (iv) people with higher secondary education versus illiterate (36.3% vs. 3.2%,  $p < 0.05$ ), (v) service holders versus unemployed (40.9% vs. 0%,  $p < 0.05$ ), (vi) low economic background versus high background (97.8% vs. 0%,  $p < 0.05$ ), (vii) people living with a family versus without family (69.9% vs. 30.1%,  $p < 0.05$ ), (viii) smokers versus nonsmokers (64.5% vs. 35.5%,  $p < 0.05$ ), (ix) heterosexuals versus bisexuals and homosexuals (97.8% vs. 1.1%,  $p < 0.05$ ), (x)

**TABLE 2** Association between the level of mpox (monkeypox) risk perception and sociodemographic profiles of the respondents.

Parameters	Mpox (monkeypox) risk perception						p value
	High, N = 93		Medium, N = 288		Low, N = 11		
	n	%	n	%	n	%	
<b>Age range (years)</b>							
18–25	47	50.5	98	34.0	5	45.5	<0.001
26–35	32	34.4	123	42.7	5	45.5	
36–45	14	15.1	67	23.3	1	9.0	
<b>BMI (kg/m<sup>2</sup>)</b>							
Below 18.5	9	9.7	18	6.2	2	18.1	<0.001
18.5–25	71	76.3	211	73.3	5	45.5	
Above 25	13	14.0	59	20.5	4	36.4	
<b>Marital status</b>							
Unmarried	44	47.3	105	36.5	7	63.6	<0.001
Married	49	52.7	183	63.5	4	36.4	
<b>Education level</b>							
Illiterate	3	3.2	32	11.1	1	9.1	<0.001
Primary	10	10.8	39	13.6	1	9.0	
Secondary	26	28.0	66	22.9	1	9.1	
Higher Secondary	34	36.6	104	36.1	4	36.4	
Graduate/above	20	21.4	47	16.3	4	36.4	
<b>Occupation</b>							
Service	38	40.9	139	48.3	4	36.4	<0.001
Business	9	9.7	44	15.3	2	18.2	
Self-employed	13	14.0	35	12.1	1	9.0	
Student	24	25.8	38	13.2	4	36.4	
Unemployed	0	0.0	12	4.2	0	0.0	
Others	9	9.6	20	6.9	0	0.0	
<b>Economic status</b>							
Low	91	97.8	271	94.1	9	81.8	<0.001
Medium	2	2.2	14	4.9	2	18.2	
High	0	0.0	3	1.0	0	0.0	
<b>Residence</b>							
Urban	48	51.6	125	43.4	7	63.6	<0.001
Rural	45	48.4	163	56.6	4	36.4	
<b>Living status</b>							
With family	65	69.9	222	77.1	8	72.7	<0.001
Without family	28	30.1	66	22.9	3	27.3	
<b>Smoking habit</b>							
Smoker	33	35.5	91	31.6	4	36.4	<0.001
Nonsmoker	60	64.5	197	68.4	7	63.6	
<b>Sexual orientation</b>							
Heterosexual	91	97.8	285	99.0	9	81.8	<0.001

(Continues)

TABLE 2 (Continued)

Parameters	Mpox (monkeypox) risk perception						p value
	High, N = 93		Medium, N = 288		Low, N = 11		
	n	%	n	%	n	%	
Bisexual	1	1.1	2	0.7	1	9.1	
Homosexual	1	1.1	1	0.3	1	9.1	
Sexual partner							
None	44	47.3	107	37.1	3	27.2	<0.001
One	46	49.5	163	56.6	5	45.5	
More than one	3	3.2	18	6.3	3	27.3	
Covid-19 impact on life							
Yes	10	10.8	26	9.0	2	18.2	<0.001
No	83	89.2	262	91.0	9	81.8	

Note:  $\chi^2$  test was used. *p* values are significant at 95% confidence interval ( $p < 0.05$ ).

Abbreviations: BMI, body mass index; N, number.

people with one sexual partner versus more than one (49.5% vs. 3.2%,  $p < 0.05$ ), (xi) people with no impact from Covid-19 versus those with having the impact from Covid-19 in their lives (89.2% vs. 10.8%,  $p < 0.05$ ). In terms of the frequency of participants possessing medium risk perception was more in (i) the age range of 26–35 versus 36–45, (42.7% vs. 23.3%,  $p < 0.05$ ), (ii) people with a BMI level between 18.5 and 25 versus below 18.5 (73.3% vs. 6.2%,  $p < 0.05$ ), (iii) married people versus unmarried (63.5% vs. 36.5%,  $p < 0.05$ ), (iv) people with higher secondary education versus illiterate (36.1% vs. 11.1%,  $p < 0.05$ ), (v) service holders versus unemployed (48.3% vs. 4.2%,  $p < 0.05$ ), (vi) low economic background versus high background (94.1% vs. 1.0%,  $p < 0.05$ ), (vii) people living with a family versus without family (77.1% vs. 22.9%,  $p < 0.05$ ), (viii) smokers versus nonsmokers (68.4% vs. 31.6%,  $p < 0.05$ ), (ix) heterosexuals versus homosexuals (99% vs. 0.3%,  $p < 0.05$ ), (x) people with one sexual partner versus more than one (56.6% vs. 6.3%,  $p < 0.05$ ), (xi) people with no impact from Covid-19 versus those with having the impact from Covid-19 in their lives (91% vs. 9%,  $p < 0.05$ ). Respondents possessing low-risk perception were higher in (i) the age group 18–25 and 26–35 versus 36–45, (45.5% vs. 9.0%,  $p < 0.05$ ), (ii) people with a BMI range of 18.5–25 versus those below 18.5 (45.5% vs. 18.1%,  $p < 0.05$ ), (iii) unmarried people versus married ones, (63.6% vs. 36.4%,  $p < 0.05$ ), (iv) participants with higher secondary education and graduates versus primary (36.4% vs. 9.0%,  $p < 0.05$ ), (v) students and service holders versus unemployed (36.4% vs. 0%,  $p < 0.05$ ), (vi) people from lower economic strata versus high-status (81.8% vs. 0%,  $p < 0.05$ ), (vii) people with a family versus without family (72.7% vs. 27.3%,  $p < 0.05$ ), (viii) heterosexuals versus bisexuals and homosexuals (81.8% vs. 9.1%,  $p < 0.05$ ), (ix) people with one sexual partner versus no partners (45.5% vs. 27.2%,  $p < 0.05$ ), (x) people not being affected by Covid-19 versus people being affected by the pandemic in their lives (81.8% vs. 18.2%,  $p < 0.05$ ). Moreover, we noticed 73.47% of respondents perceived medium level of Mpox risk and 23.72% perceived high-level risk (Figure 1).

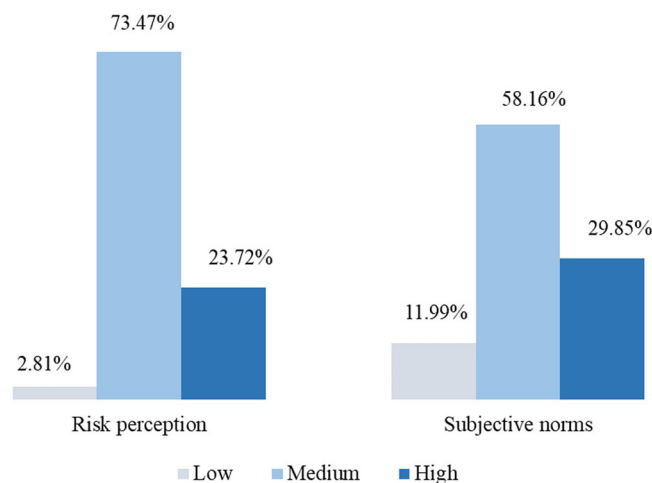


FIGURE 1 Level of Mpox (monkeypox) risk perception and subjective norms among the respondents.

### 3.3 | Association between the level of Mpox subjective norms and sociodemographic profiles

The average score of subjective norms in all participants were 6.75 in a scale of 0 to 12. We presented the association between the level of Mpox subjective norms and sociodemographic profiles of the respondents in Table 3. Estimates of participants' high belief about the significance of subjective norms were higher in (i) those aged 18–25 versus 36–45, (39.3% vs. 24.8%,  $p < 0.05$ ), (ii) people with a BMI of 18.5–25 versus those below 18 (72.6% vs. 7.7%,  $p < 0.05$ ), (iii) married persons versus unmarried people (59.2% vs. 40.8%,  $p < 0.05$ ), (iv) people with a higher secondary education versus illiterates (40.2% vs. 6.0%,  $p < 0.05$ ), (v) people in the service versus those in other jobs (48.7% vs. 0.9%,  $p < 0.05$ ), (vi) low-status versus high-status individuals (96.6% vs. 0%,  $p < 0.05$ ), (vii) urban versus rural residents, (54.7% vs. 45.3%,  $p < 0.05$ ), (viii) persons who live with versus

**TABLE 3** Association between the level of Mpox (monkeypox) subjective norms and sociodemographic profiles of the respondents.

Parameters	Mpox (monkeypox) subjective norms						p value
	High, N = 117		Medium, N = 228		Low, N = 47		
	n	%	n	%	n	%	
Age range (years)							
18–25	46	39.3	83	36.4	21	44.7	<0.001
26–35	42	35.9	101	44.3	17	36.2	
36–45	29	24.8	44	19.3	9	19.1	
BMI (kg/m <sup>2</sup> )							
Below 18.5	9	7.7	16	7.0	4	8.5	<0.001
18.5–25	85	72.6	167	73.2	35	74.5	
Above 25	23	19.7	45	19.8	8	17.0	
Marital status							
Unmarried	47	40.2	90	39.5	19	40.4	<0.001
Married	70	59.8	138	60.5	28	59.6	
Education level							
Illiterate	7	6.0	23	10.1	6	12.8	<0.001
Primary	18	15.3	28	12.3	4	8.5	
Secondary	23	19.7	59	25.9	11	23.4	
Higher Secondary	47	40.2	78	34.2	17	36.2	
Graduate/above	22	18.8	40	17.5	9	19.1	
Occupation							
Service	57	48.7	109	47.8	15	31.9	<0.001
Business	11	9.4	35	15.4	9	19.1	
Self-employed	28	23.9	15	6.6	6	12.8	
Student	16	13.7	40	17.5	10	21.3	
Unemployed	4	3.4	6	2.6	2	4.3	
Others	1	0.9	23	10.1	5	10.6	
Economic status							
Low	113	96.6	214	93.9	44	93.6	<0.001
Medium	4	3.4	12	5.2	2	4.3	
High	0	0.0	2	0.9	1	2.1	
Residence							
Urban	64	54.7	94	41.2	22	46.8	<0.001
Rural	53	45.3	134	58.8	25	53.2	
Living status							
With family	84	71.8	176	77.2	35	74.5	<0.001
Without family	33	28.2	52	22.8	12	25.5	
Smoking habit							
Smoker	41	35.0	66	28.9	21	44.7	<0.001
Nonsmoker	76	65.0	162	71.1	26	55.3	
Sexual orientation							
Heterosexual	116	99.1	222	97.4	47	100.0	<0.001

(Continues)



TABLE 3 (Continued)

Parameters	Mpox (monkeypox) subjective norms						p value
	High, N = 117		Medium, N = 228		Low, N = 47		
	n	%	n	%	n	%	
Bisexual	1	0.9	2	0.9	0	0.0	
Homosexual	0	0.0	3	1.3	0	0.0	
Pansexual	0	0.0	1	0.4	0	0.0	
Sexual partner							
None	51	43.6	84	36.8	19	40.4	<0.001
One	63	53.8	131	57.5	20	42.6	
More than one	3	2.6	13	5.7	8	17.0	
Covid-19 impact on life							
Yes	12	10.3	20	8.8	6	12.8	<0.001
No	105	89.7	208	91.2	41	87.2	

Note:  $\chi^2$  test was used. *p* values are significant at 95% confidence interval ( $p < 0.05$ ).

Abbreviations: BMI, body mass index; N, number.

without a family (71.8% vs. 28.2%,  $p < 0.05$ ), (ix) nonsmokers versus smokers, (65% vs. 35%,  $p < 0.05$ ), (x) heterosexuals versus homosexuals & Pansexual (99.1% vs. 0%,  $p < 0.05$ ), (xi) people with one sexual partner versus more than one partner (53.8% vs. 2.6%,  $p < 0.05$ ), (xii) and people with no impact of Covid-19 in their lives (89.7% vs. 10.3%,  $p < 0.05$ ). Proportions of people with moderately influenced by family members or colleagues for vaccination were more observed in (i) people who were in the age group of 26–35 versus 36–45 (44.3% vs. 19.3%,  $p < 0.05$ ), (ii) people whose BMI level was 18.5–25 versus those below 18 (73.2% vs. 7.0%,  $p < 0.05$ ), (iii) married people versus unmarried (60.5% vs. 39.5%,  $p < 0.05$ ), (iv) people with a higher secondary education versus illiterates (34.2% vs. 10.1%,  $p < 0.05$ ), (v) people in the service versus unemployed people (47.8% vs. 2.6%,  $p < 0.05$ ), (vi) low-status versus high-status individuals (93.9 vs. 0.9%,  $p < 0.05$ ), (vii) rural people versus urban people (58.8% vs. 41.2%,  $p < 0.05$ ), (viii) persons who live with versus without a family (77.2% vs. 22.8%,  $p < 0.05$ ), (ix) nonsmokers versus smokers, (71.1% vs. 28.9%,  $p < 0.05$ ), (x) heterosexuals versus Pansexual (97.4% vs. 0.4%,  $p < 0.05$ ), (xi) people with one sexual partner versus more than one partner (57.5% vs. 5.7%,  $p < 0.05$ ), (xii) and people with no impact of Covid-19 in their lives (91.2% vs. 8.8%,  $p < 0.05$ ). Low-level subjective norms were higher in (i) those aged 18–25 versus 36–45 (44.7% vs. 19.1%,  $p < 0.05$ ), (ii) people with a BMI of 18.5–25 versus those below 18 (74.5% vs. 8.5%,  $p < 0.05$ ), (iii) married persons versus unmarried people (59.6% vs. 40.4%,  $p < 0.05$ ), (iv) people with a higher secondary education versus primary education (36.2% vs. 8.5%,  $p < 0.05$ ), (v) people in the service versus unemployed people (31.9% vs. 4.3%,  $p < 0.05$ ), (vi) low-status versus high-status individual (93.6% vs. 2.1%,  $p < 0.05$ ), (vii) people who were from rural areas versus urban (53.2% vs. 46.8%,  $p < 0.05$ ), (viii) persons living with a family versus without a family (74.5% vs. 25.5%,  $p < 0.05$ ), (ix) nonsmokers versus smokers, (55.3% vs. 44.7%,

$p < 0.05$ ), (x) heterosexuals, (xi) people with one sexual partner versus more than one partner (42.6% vs. 17.0%,  $p < 0.05$ ), (xii) and people with no impact of Covid-19 in their lives (87.2% vs. 12.8%,  $p < 0.05$ ). Moreover, we observed 58.16% of respondents followed medium level of Mpox subjective norms and 29.85% followed high-level (Figure 1).

### 3.4 | Regression analysis

We estimated the relationship between the dependent and independent variables using the multiple logistic regression model (Tables 4 and 5). According to our findings, illiterate people were 0.23 times less likely than graduates to have high-risk perceptions, and nonsmokers were 0.4 times less likely to have high-risk perceptions than smokers. In terms of having low-risk perceptions, we discovered that the probability was 0.05 times lower in people with a BMI below 18 than those above 25; 0.02 times lower in married people than unmarried people; 0.007 times lower in people from a low economic background than those from a high background; 0.022 times lower in people with no sexual partner than those with more than one sexual partner; and 0.18 times lower in people with no impact of Covid-19 in their lives than those who claimed to have an impact of Covid-19. The likelihood of having high subjective norms was 2.25 times higher in the secondary education group than in the graduate group and 0.05 times lower in unemployed people than in other occupations. People with primary education were 2.55 times more likely to have medium subjective norms than graduates, business people were 0.04 times less likely to have medium subjective norms than another occupation group, and also, urban people were found to have 0.43 times lower possibility to possess medium subjective belief than rural people. The possibility of having low subjective norms was 5.99 times



**TABLE 4** Regression analysis of variables by the level of Mpox (monkeypox) risk perception among the respondents.

	High-risk perception, N = 93			Medium risk perception, N = 288			Low-risk perception N = 11		
	OR	95% CI	p value	OR	95% CI	p value	OR	95% CI	p value
<b>Age range (years)</b>									
18–25	2.659	0.986–7.170	0.053	1.291	0.299–5.584	0.732	2.895	0.259–32.352	0.388
26–35	1.103	0.458–2.659	0.827	1.041	0.305–3.557	0.949	1.794	0.250–12.859	0.561
36–45	1			1			1		
<b>BMI (kg/m<sup>2</sup>)</b>									
Below 18.5	0.573	0.213–1.540	0.270	0.818	0.156–4.294	0.812	0.055	0.010–0.290	0.001
18.5–25	0.439	0.133–1.449	0.176	0.810	0.122–5.366	0.827	0.401	0.065–2.496	0.327
Above 25	1			1			1		
<b>Marital status</b>									
Married	1.280	0.431–3.797	0.657	0.967	0.178–5.257	0.969	0.023	0.003–0.200	0.001
Unmarried	1			1			1		
<b>Education level</b>									
Illiterate	0.237	0.057–0.991	0.049	0.718	0.124–4.148	0.712	1.247	0.104–14.874	0.862
Primary	0.668	0.238–1.879	0.445	0.911	0.209–3.980	0.902	1.043	0.113–9.598	0.970
Secondary	0.894	0.441–1.813	0.755	0.991	0.329–2.982	0.987	2.182	0.445–10.693	0.336
Higher secondary	1.946	0.771–4.912	0.159	1.209	0.283–5.165	0.798	4.200	0.644–27.403	0.134
Graduate/above	1			1			1		
<b>Occupation</b>									
Service	4.616	0.335–63.542	0.253	1.475	0.119–18.300	0.762	4.346	0.118–159.925	0.425
Business	6.122	0.391–95.767	0.197	1.611	0.103–25.090	0.734	11.248	0.229–551.935	0.223
Self-employed	15.284	0.958–243.763	0.054	2.041	0.119–35.136	0.623	23.350	0.433–1258.209	0.121
Student	10.619	0.735–153.440	0.083	1.882	0.130–27.291	0.643	36.825	0.807–1680.694	0.064
Unemployed	14.327	0.906–226.632	0.059	1.876	0.104–33.819	0.670	1.915	0.025–148.423	0.770
Others	1			1			1		
<b>Economic status</b>									
Low	1.917	0.240–15.333	0.539	1.075	0.078–14.836	0.957	0.007	0.001–0.051	0.000
Medium	0.096	0.096–0.096	.	0.463	0.463–0.463	-	-	-	-
High	1			1			1		
<b>Residence</b>									
Urban	0.043	0.001–2.645	0.134	0.445	0.006–32.572	0.712	0.036	0.000–7.957	0.228
Rural	1			1			1		
<b>Living status</b>									
With family	1.201	0.523–3.799	1.082	1.729	0.418–10.2	1.783	5.471	0.900–34.910	0.620
Without family	1			1			1		
<b>Smoking habit</b>									
Nonsmoker	0.474	0.250–0.899	0.022	0.850	0.319–2.265	0.746	1.380	0.353–5.394	0.644
Smoker	1			1			1		
<b>Sexual partner</b>									
None	1.235	0.421–3.624	0.701	0.959	0.184–4.984	0.960	0.022	0.003–0.160	<0.001

(Continues)

TABLE 4 (Continued)

	High-risk perception, N = 93			Medium risk perception, N = 288			Low-risk perception N = 11		
	OR	95% CI	p value	OR	95% CI	p value	OR	95% CI	p value
One	0.542	0.080–3.698	0.532	0.904	0.100–8.204	0.928	5.878	0.683–50.618	0.107
More than one	1			1			1		
Covid-19 impact on life									
No	1.004	0.388–2.598	0.994	0.963	0.221–4.190	0.960	0.180	0.039–0.822	0.027
Yes	1			1			1		

Note: *p* values are significant at 95% confidence interval ( $p < 0.05$ ).

Abbreviations: BMI, body mass index; CI, confidence interval; N, number; OR, odds ratio.

higher in people having one sexual partner than those involved with more than one sexual partner.

## 4 | DISCUSSION

Our study found that 73.47% and 54.16% of our study participants possessed medium risk perceptions and subjective norms related to Mpox. As the Mpox outbreak revealed some new facts regarding Mpox, it is necessary to have a thorough knowledge of the disease.<sup>27</sup> Moreover, risk perception and normative beliefs influence people to adopt protective measures such as vaccination against the disease. Therefore, we conducted this study to investigate Mpox risk perception and subjective norms perception among our study participants.

We discovered that among all the participants, 23.72% and 73.47% of total respondents possessed high and medium-risk perceptions, respectively, while only 2.81% of respondents were found to have low-risk perceptions. Overall, the Mpox association risk perception among our participants was quite good. According to the findings of a study, 66% of 1711 Bangladeshi participants were aware of Mpox but perceived a lack of knowledge about the Mpox transmission pathways and symptoms.<sup>28</sup> A survey of the general population of Saudi Arabia indicated that less than half (48%) of the 480 respondents had high knowledge about Mpox.<sup>12</sup> Similarly, Italian physicians were found to have a knowledge gap and inconsistent risk perception, which highlighted the need for an adequate communication campaign.<sup>29</sup> As per a study, more than half of the participants felt the risk of another global pandemic because of the current Monkeypox virus outbreak.<sup>27</sup> We also examined the belief of our participants about the impact of their family members or close ones, where we identified 58.16% and 29.85% of total participants perceived medium and high-level subjective norms, while 11.99% of respondents seemed to have a low influence of their family members and colleagues in case of receiving the vaccination against Mpox. A few studies claimed that family, friends, or society greatly impacted vaccination intention.<sup>30,31</sup>

In addition, we observed a significant association between risk perception and sociodemographic attributes. The majority of our participants who perceived medium and high-risk perceptions belong

to the younger age group and normal BMI range, as in the current digital era, these age groups are more involved in internet communication, which is a source of information, and more conscious of their health.<sup>32,33</sup> Other parameters such as marital status, education level, occupation status, economic status, and the residential area of our study participants expressed a significant association with risk perceptions. Respondents with secondary education and in-service appeared to have medium and high-risk perceptions than any other educational level or occupation, and the same finding we observed in another study.<sup>34</sup> Furthermore, we observed medium and high-risk perceptions mostly in those participants who did not have any impact from the Covid-19 pandemic whereas a report stated that participants who experienced the Covid-19 pandemic were more worried about Mpox.<sup>27</sup>

Our findings also indicated a significant correlation between subjective norms and participants' sociodemographic attributes. Compared with other age groups, younger participants were likely to have medium and high levels of influence from their family, friends, or colleagues. Furthermore, individuals who were married, heterosexuals with one sexual partner, lived with a family, and worked in the service were found to have moderate to high degrees of influence on their vaccination intention, and a similar study regarding Mpox also reported that their worries for themselves and their family members influenced them for vaccination.<sup>27</sup> While a few studies indicated a positive influence on family members and friends,<sup>24</sup> negative doubts regarding the side effects of vaccines from family or friends discouraged participants.<sup>35,36</sup>

To our best knowledge, this is the first study conducted on the Bangladeshi population to measure their risk perceptions and subjective norms associated with Mpox, which could be predictors for their agreement with vaccination. Risk perception and normative beliefs are associated with vaccination intention.<sup>21–24</sup> A study conducted on the US population to examine the Mpox vaccination attitudes of the participants revealed that those with the highest risk perception appeared to be more interested in receiving the vaccination.<sup>20</sup> During the Covid-19 pandemic, people severely affected by the coronavirus showed agreement with vaccination acceptance.<sup>37–39</sup> Some participants in the same study believed that their family and friends influenced their vaccination decision.<sup>40,41</sup> Similarly, participants assumed to be at the highest risk had a

**TABLE 5** Regression analysis of variables by the level of Mpox (monkeypox) subjective norms among the respondents.

	High subjective norms, N = 117			Medium subjective norms, N = 288			Low subjective norms, N = 47		
	OR	95% CI	p value	OR	95% CI	p value	OR	95% CI	p value
<b>Age range (years)</b>									
18–25	1.173	0.462–2.980	0.737	0.922	0.339–2.508	0.874	2.344	0.625–8.786	0.206
26–35	0.587	0.260–1.324	0.199	0.507	0.211–1.217	0.128	1.108	0.360–3.412	0.859
36–45	1			1			1		
<b>BMI (kg/m<sup>2</sup>)</b>									
Below 18.5	0.654	0.242–1.765	0.402	0.796	0.275–2.301	0.674	0.525	0.149–1.856	0.317
18.5–25	0.791	0.252–2.478	0.687	0.964	0.289–3.209	0.952	0.350	0.076–1.618	0.179
Above 25	1			1			1		
<b>Marital status</b>									
Married	2.598	0.926–7.285	0.070	1.459	0.516–4.122	0.476	1.626	0.443–5.976	0.464
Unmarried	1			1			1		
<b>Education level</b>									
Illiterate	0.318	0.088–1.152	0.081	2.368	0.906–6.188	0.079	0.825	0.184–3.700	0.801
Primary	1.241	0.466–3.302	0.665	2.557	1.163–5.624	0.020	0.872	0.218–3.482	0.846
Secondary	2.259	1.096–4.655	0.027	0.510	0.135–1.928	0.321	1.488	0.560–3.953	0.425
Higher secondary	2.085	0.844–5.150	0.111	1.524	0.533–4.363	0.432	2.508	0.722–8.710	0.148
Graduate/above	1			1			1		
<b>Occupation</b>									
Service	0.577	0.130–2.562	0.470	0.420	0.078–2.281	0.315	0.703	0.079–6.260	0.752
Business	0.511	0.099–2.653	0.425	0.041	0.003–0.544	0.016	2.213	0.210–23.301	0.508
Self-employed	4.674	0.825–26.480	0.081	3.424	0.583–20.118	0.173	3.572	0.290–44.072	0.321
Student	0.317	0.065–1.532	0.153	0.616	0.136–2.785	0.530	1.158	0.121–11.112	0.899
Unemployed	0.058	0.005–0.716	0.026	0.254	0.050–1.299	0.100	1.947	0.181–20.992	0.583
Others	1			1			1		
<b>Economic status</b>									
Low	1.428	0.382–5.335	0.596	2.235	0.516–9.686	0.283	1.580	0.255–9.801	0.623
Medium	0.241	0.001–0.374	0.595	0.718	0.034–0.335	0.652	14.977	0.369–607.366	0.152
High	1			1			1		
<b>Residence</b>									
Urban	0.953	0.482–1.883	0.890	0.403	0.214–0.760	0.005	0.613	0.038–9.945	0.731
Rural	1			1			1		
<b>Living status</b>									
With family	2.197	0.856–6.018	1.043	1.920	0.544–6.780	0.311	2.535	0.645–11.488	0.428
Without family	1			1			1		
<b>Smoking habit</b>									
Smoker	0.608	0.043–8.557	0.712	0.514	0.293–1.094	0.090	1.156	0.057–23.316	0.924
Nonsmoker	1			1		1			
<b>Sexual partner</b>									
None	2.400	0.902–6.382	0.079	0.529	0.035–7.970	0.645	1.465	0.423–5.078	0.547

(Continues)

TABLE 5 (Continued)

	High subjective norms, N = 117			Medium subjective norms, N = 288			Low subjective norms, N = 47		
	OR	95% CI	p value	OR	95% CI	p value	OR	95% CI	p value
One	0.513	0.092–2.869	0.447	0.621	0.123–3.125	0.564	5.994	1.594–22.543	0.008
More than one	1			1			1		
Covid-19 impact on life									
No	1.036	0.444–2.420	0.935	1.330	0.559–3.164	0.519	0.700	0.229–2.142	0.532
Yes	1			1			1		

Note: p values are significant at 95% confidence interval ( $p < 0.05$ ).

Abbreviations: BMI, body mass index; CI, confidence interval; N, number; OR, odds ratio.

favorable attitude toward vaccination,<sup>42–45</sup> whereas people with lower risk perceptions had lower vaccination intentions, according to a few additional studies.<sup>43,46</sup> A study conducted among clinicians in the United States stated that participants who perceived a higher risk perception of Mpox were more likely to be ready to receive the vaccine, and they were concerned about the people who did not consider Mpox a severe risk as they were less likely to be interested in vaccination uptake.<sup>20</sup> People in the United States with a higher risk perception wanted to get vaccinated against COVID-19.<sup>47</sup> Little is known about the impact of subjective norms on Mpox vaccine acceptance, although previous studies on COVID-19 vaccines indicated that subjective norms perception influenced the acceptability of COVID-19 vaccination.<sup>48,49</sup> As a result, we can predict that in the Mpox situation, people with higher subjective norms may show their agreement with Mpox vaccines. Since most of our participants possess a moderate-to-high risk perception and subjective norms, they may perceive a positive attitude toward vaccination in the future.

#### 4.1 | Strengths and limitations

Previously, most research was conducted to identify participants' knowledge levels; however, in this study, we aimed to examine risk perception and subjective norms, and the association of sociodemographic characteristics with our major study parameters. Our study recruited participants from various economic backgrounds, educational levels, sexual orientations, and residential areas to observe their perceptions of Mpox. We also ensured that the participants understood the purpose of this study and the questionnaire by attaching a Bangla translation to the Google Form. There are some drawbacks to this study. This web-based cross-sectional study may have biases due to convenient sampling and does not represent people who do not have internet access. Also, low response rate is another limitation to generalize the present findings. We included limited questions to assess risk perceptions and subjective norm perceptions associated with Mpox. As it was a cross-sectional study, we failed to explain the causality behind all the associations among the parameters of this study. We believe that direct interviews and

longitudinal studies with more participants would yield a more generalizable result in the future.

## 5 | CONCLUSION

Our findings provided primary insights into the participant's risk perception and subjective norm perceptions of Mpox. Overall, both perceptions regarding risks and subjective norms were moderate. Possession of risk perception and influence from social norms reflect on behavioral and health attitudes, including vaccine intention. As a result, according to our findings, we can predict that people with moderate to increased risk perception and subjective norms may perceive a positive attitude toward protective behavior such as vaccination since these are the prerequisites for adopting prevention. We recommend that further longitudinal studies be conducted via direct interviews with more participants to yield more accurate findings in the future.

#### AUTHOR CONTRIBUTION

**Nazmunnaahar:** Investigation; methodology; writing—original draft. **Md. Anamul Haque:** Conceptualization; data curation. **Bulbul Ahamed:** Conceptualization; data curation. **Md. Tanbir:** Conceptualization; data curation. **Farhana Islam Suhee:** Investigation; methodology; writing—original draft. **Md. Rabiul Islam:** Conceptualization; project administration; writing—review & editing.

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#### CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

#### DATA AVAILABILITY STATEMENT

All the relevant data and information will be available from the corresponding author upon reasonable request.

#### TRANSPARENCY STATEMENT

The lead author Md. Rabiul Islam affirms that this manuscript is an honest, accurate, and transparent account of the study being

reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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