

# Sexual Behavior of Men Who Have Sex with Men and Its Relationship to Sexually Transmitted Infections during an Outbreak of the Human Monkeypox Virus

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## ABSTRACT

**Background:** There is a high frequency of monkeypox (MPOX) and sexually transmitted infections (STIs) in men who have sex with men (MSM).

**Aim:** To identify the sexual behavior of MSM during the MPOX infection period.

**Methods:** We conducted an observational study of cases and controls were carried out.

**Results:** A total of 171 participants were considered, two heterosexual male controls (MSW) were included for each case of MSM with a consecutive selection of people who attended the STI prevention and control center from January to July 2022.

The results revealed that the mean number of sexual partners reported in the last year was higher in cases (4.2) compared to controls 1.9 ( $p < 0.05$ ). The related conditions for MSM to acquire some type of STI were sexual intercourse under the influence of alcohol (OR 2.42; 95% CI: 1.11–3.96), forgetting to use a protection method (condom) (OR 3.16; 95%: 1.73–7.48) and sexual intercourse with casual couples (OR 1.4; 95% CI: 1.01–2.16).

**Conclusion:** Our findings demonstrated a link between the sexual behavior of men who have sex with men and the high prevalence of sexually transmitted infections during the human monkeypox virus outbreak.

## KEYWORDS

monkeypox; sexually transmitted infections; men who have sex with men; sexual behavior

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Received: 4 October 2022

Accepted: 9 January 2023

Published online: 16 March 2023

Acta Medica (Hradec Králové) 2022; 65(4): 133–138

<https://doi.org/10.14712/18059694.2023.3>

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## INTRODUCTION

Monkeypox (MPOX) is a zoonotic virus that belongs to the Poxviridae family, transmission occurs through direct contact with respiratory secretions and skin lesions of infected people (1). The first reported case of MPOX was in the Democratic Republic of the Congo in 1970 which affected people who have been in close contact with animals since 1990. The cases were due to direct contact with affected people, causing a progressive increase in the frequency of cases (2).

This virus remained endemic in some African countries, until May 2022 when other continents received notices of MPOX cases. On July 26, 2022, the World Health Organization (WHO) decreed MPOX as a Public Health Emergency of Importance (1). Due to the global increase in cases and even though it is not a sexual disease, this increase was for the most part concentrated among men who have sex with other men transmission (MSM) (3), because sexual contact and prolonged exposure to the affected person increases the risk of transmission through the exchange of fluids and respiratory secretions.

The United States notified about three thousand settlements between May and June 2022 rapidly increasing in people infected by the MPOX, the median age reported was 35 years, 99% were MSM and with a history of sexual contact for three weeks before the onset of symptoms. Among the most common clinical manifestations were: skin rashes associated with fever, chills and rectal pain. Skin rashes were frequent in the genital region, arms, face, and legs (4). The number of patients was increasing and until December 2022, around 84,000 cases were reported worldwide, arising in 110 countries, and in Peru approximately 3,600 cases were reported, and is the South American country with the highest number of reported cases (5).

MPOX infection is a current public health problem, due to its high morbidity rates and associated complications. The findings of the studies agree that MPOX mainly affects MSM with a history of sexual contact before the development of the disease. The objective of this study was to identify the sexual behavior of MSM during the period of MPOX infection and to understand the relationship with sexually transmitted infections (STIs).

## METHODS

### POPULATION AND STUDY DESIGN

The present control-case study was conducted on 57 MSM cases and 114 controls of non-MSM participants. All participants were male residents of Peru. A total of 171 participants were recruited to the study between January and July 2022, due to privacy concerns the participant-driven sampling (PDM) method was used (6), this recruitment started with 20 people who attended for the first time the control program of sexually transmitted infections (STIs) of the Carrion Hospital in the study period. Initially, each participant was called a seed who had to freely invite two contacts to be able to participate in the study, each of the new participants who entered the study referred by the

seeds, had to invite another two friends until reaching 57 MSM and 114 non-MSM participants. The inclusion criteria were males over 15 years old, answering the questionnaire, and agreeing to be tested for HIV and other STIs. Sex workers were excluded. The sample size was calculated using the proportions method, considering a sample power of 0.90, a bilateral probability of type I error of 0.05 for a proportion of MSM and STIs of 60% in cases (7) and a proportion of MPOX in MSM of 88% (8) and a case to control ratio of 1 : 2.

### PROCEDURES

After agreeing to participate in the study, the participants responded to a previously structured, anonymous, and validated survey, which evaluated sexual behavior and the most frequent conditions associated with risk behaviors for STIs. Subsequently, each participant was given counseling on HIV and STIs, and samples for HIV, hepatitis B, Hepatitis C, and syphilis were screened using the immunochromatography method (rapid test).

### STATISTICAL ANALYSIS

For the analysis, the statistical program STATA version 14.0 for Windows (STATA Corp, College Station, TX, US) was used. Categorical variables were compared using the Chi-square estimator or Fisher's exact test, as appropriate. Student's t-test was used for numerical variables, in addition to the mean and standard deviation (SD). Finally, the multivariable logistic regression model was performed to estimate the risk factors for STIs in MSM. The variables with a value of  $p < 0.10$  from the univariate model were included in the multivariate model using the backward method, the odds ratio (OR) and their confidence interval values (95% CI) were calculated, and the level of significance set was 0.05. The potential confounding variables included in the model were age, and comorbidities.

### ETHICAL ASPECTS

This study was approved by the institutional committee of the Hospital Daniel Alcides Carrion number 24-2022. In addition, the study obtained the informed consent of each participant, and her information was kept confidential, respecting her identity.

## RESULTS

Of a total of 171 enrolled participants, the mean age was 37 (16-70) years, the MSM participants were relatively younger with a mean age of 31 (16-65) years, and the most frequent group was between 16 and 24 years (42.6%). Trade was the most frequent labor activity (45/171; 26.5%). The diagnosis of HIV infection was positive in 101 patients (101/171; 59.1%) of which 52 (91.2%) belonged to the MSM group and 46 (40.3%) participants in the group of men who have sex only with women (MSW).

Among the 171 participants, 104 (61.4%) were also diagnosed with other STIs, 54 (94.7%) were MSM, and

50 (43.8%) patients were MSW ( $p < 0.001$ ). The most STI frequently identified was syphilis in 41 (39.1%) people. The second most frequent was genital herpes, which was present in 24 (22.9%) participants.

In terms of the number of sexual couples in the past year, the average number of couples was 2.7 (0 to 30) in the total participants, 4.2 (1 to 30) was the average in the MSM group, and 1.9 (0 to 10) in the MSW group. The average number of sexual couples during the last 5 years was 6.7 (1 to 100), MSM participants had an average of 12.7 (1 to 100) couples and in the MSW the average was 3.7 (1 to 20).

More than half of the participants (91/171; 66.4%) had sexual intercourse while under the influence of alcohol, of which 30 participants (83.3%) were MSM, and 61 (60.4%)

were MSW, the consumption of drugs during intercourse was reported by 5 (3.7%) participants (Table 1).

Less than half of the patients (76/171, 44.4%) reported that they did not use condom during sexual intercourse, of which 28 people were from the MSM group (28/57, 49.1%). More than half of the participants (87/171, 50.9%) forgot to use a condom at some time, it was observed that 56% were in the MSM group and 40.4% localized in the MSW group. The average number of times they forgot to use a condom in the last month was 3.2, higher in the MSM group ( $p = 0.036$ ).

Most of the patients surveyed went to nightclubs (114/171, 66.7%), which represented 45 (78.9%) of the MSM patients and 69 (60.5%) participants of the MSW group ( $p = 0.017$ ). The average number of times per month that they went to nightclubs was 1.4 in total, which includes

**Tab. 1** Characteristics of the study population according to the sexual behavior of men.

| Characteristic                                             | Total<br>n = 171 (%) | MSM<br>n = 57 (%) | MSW<br>n = 114 (%) | p-value* |
|------------------------------------------------------------|----------------------|-------------------|--------------------|----------|
| Age (years): mean (age range)                              | 37 (16–70)           | 31 (16–65)        | 40 (18–70)         | 0.008    |
| 16–24                                                      | 51 (30.5%)           | 23 (42.6%)        | 28 (24.8%)         | 0.013    |
| 25–39                                                      | 55 (32.9%)           | 19 (35.2%)        | 36 (31.8%)         |          |
| > 39                                                       | 61 (36.5%)           | 12 (22.2%)        | 49 (43.4%)         |          |
| <b>Occupation</b>                                          |                      |                   |                    |          |
| Businessman                                                | 45 (26.5%)           | 24 (42.8%)        | 21 (18.4%)         | 0.017    |
| Student                                                    | 24 (14.1%)           | 5 (8.9%)          | 19 (16.7%)         |          |
| Farmer                                                     | 24 (14.1%)           | 4 (7.1%)          | 20 (17.5%)         |          |
| Builder                                                    | 13 (7.6%)            | 4 (7.1%)          | 9 (7.9%)           |          |
| Driver                                                     | 13 (7.6%)            | 1 (1.8%)          | 12 (10.5%)         |          |
| Public office                                              | 18 (10.6%)           | 7 (12.5%)         | 11 (9.6%)          |          |
| HIV POSITIVE                                               | 101 (59.1%)          | 52 (91.2%)        | 49 (42.9%)         | < 0.001  |
| STIs                                                       | 104 (61.4%)          | 54 (94.7%)        | 50 (43.8%)         | < 0.001  |
| <b>Type of STI</b>                                         |                      |                   |                    |          |
| Syphilis                                                   | 41 (39.1%)           | 27 (49.1%)        | 14 (28%)           | 0.250    |
| Herpes                                                     | 27 (25.8%)           | 13 (23.6%)        | 14 (87%)           |          |
| Gonorrhoea                                                 | 23 (21.9%)           | 9 (16.4%)         | 14 (28%)           |          |
| Condyloma acuminatum                                       | 12 (11.4%)           | 9 (16.4%)         | 3 (5.6%)           |          |
| Proctitis                                                  | 3 (2.9%)             | 3 (5.5%)          | 0 (0%)             |          |
| Number of sexual partners last year (average and range)    | 2.7 (0–30)           | 4.2 (1–30)        | 1.9 (0–10)         | < 0.001  |
| Number of sexual partners last 5 years (average and range) | 6.7 (1–100)          | 12.7 (1–100)      | 3.7 (1–20)         | < 0.001  |
| <b>Sex under the influence of substances</b>               |                      |                   |                    |          |
| None                                                       | 41 (29.9%)           | 1 (2.8%)          | 40 (39.6%)         | < 0.001  |
| Alcohol                                                    | 91 (66.4%)           | 30 (83.3%)        | 61 (60.4%)         |          |
| Drugs                                                      | 5 (3.7%)             | 5 (13.8%)         | 0 (0%)             |          |
| Rape victim                                                | 23 (14.5%)           | 18 (36%)          | 5 (4.6%)           | < 0.001  |
| <b>Use a condom during sexual intercourse</b>              |                      |                   |                    |          |
| Yes                                                        | 77 (45.1%)           | 21 (36.8%)        | 56 (49.1%)         | 0.247    |
| No                                                         | 76 (44.4%)           | 28 (49.1%)        | 48 (42.1%)         |          |
| Sometimes                                                  | 18 (10.5%)           | 8 (14.1%)         | 10 (8.7%)          |          |
| Have you ever forgotten to use a condom?                   | 87 (50.9%)           | 32 (56.1%)        | 46 (40.4%)         | < 0.032  |
| Times you forget to use a condom per month (average)       | 3.2                  | 3.5               | 2.8                | 0.036    |

| Characteristic                                                         | Total<br>n = 171 (%) | MSM<br>n = 57 (%) | MSW<br>n = 114 (%) | p-value* |
|------------------------------------------------------------------------|----------------------|-------------------|--------------------|----------|
| Do you go to a night club or a brothel?                                | 114 (66.7%)          | 45 (78.9%)        | 69 (60.5%)         | 0.017    |
| How many times a month do you go to a night club or brothel? (average) | 1.4 (0.1–16)         | 2.4 (0.5–15)      | 1.1 (0.1–16)       | 0.035    |
| <b>How did you get STI?</b>                                            |                      |                   |                    |          |
| Does not know                                                          | 14 (15.5%)           | 6 (11.5%)         | 8 (21.1%)          | 0.095    |
| With your stable partner                                               | 25 (27.8%)           | 21 (40.3%)        | 4 (10.5%)          |          |
| In a brothel                                                           | 3 (3.3%)             | 1 (1.9%)          | 2 (5.3%)           |          |
| With an occasional partner                                             | 33 (36.7%)           | 17 (32.7%)        | 16 (42.1%)         |          |
| With street sex worker                                                 | 8 (8.9%)             | 4 (7.7%)          | 4 (10.5%)          |          |
| Rape victim                                                            | 2 (2.2%)             | 1 (1.9%)          | 1 (2.6%)           |          |
| <b>Transmitted STI to another person</b>                               |                      |                   |                    |          |
| Yes                                                                    | 54 (57.5%)           | 31 (56.4%)        | 23 (58.9%)         | 0.485    |
| No                                                                     | 40 (42.6%)           | 24 (43.6%)        | 16 (41.1%)         |          |
| Average (range)                                                        | 2.28 (0–8)           | 2.8 (0–8)         | 1.6 (0–5)          | 0.0487   |
| Comorbidity                                                            | 64 (37.4%)           | 24 (42.1%)        | 40 (35.1%)         | 0.405    |
| <b>Type of comorbidity</b>                                             |                      |                   |                    |          |
| Gastritis                                                              | 13 (20.3%)           | 2 (8.3%)          | 11 (27.5%)         | 0.252    |
| Diarrhea                                                               | 14 (21.8%)           | 7 (29.2%)         | 7 (17.5%)          |          |
| Tuberculosis                                                           | 10 (15.6%)           | 5 (20.8%)         | 5 (12.5%)          |          |

\* Fisher's exact test was used to calculate the p-value in the case of categorical variables, and Student t test for numerical variables. MSM: Men who have sex with men; MSW: Men who have only sex with women (Heterosexual men); STI: sexually transmitted infection.

2.4 (0.5 to 15) on average in MSM participants and 1.1 (0.1 to 16) in MSW participants ( $p = 0.035$ ). The history of rape was reported in 23 (14.5%) of the total participants, 18 (36%) in the MSM group while 5 (4.6%) people were in the MSW ( $p < 0.001$ ).

Less than half of the people (33; 36.7%) mentioned that some occasional partner was the one who transmitted the STI or HIV to them, another 25 (27.8%) participants mentioned that their stable partner was the one who infected them with the STI and less frequent it was those who answered that they do not know where they acquired the infection (14; 15.5%). In question, how many people you infected with an STI, the average number of infected people by the participants was 2.28 (0 to 8), in terms of frequency this average was higher in MSM people 2.8 (0 to 8) while in the MSW group the average number of people to whom the infectious agent was transmitted was 1.6 (0 to 5)  $P = 0.048$ . Most patients reported some comorbidity, the most frequent being diarrhea 14 (21.8%) followed by gastritis 13 (20.3%). Participants belonging to the MSM group have approximately 5 times more risk of suffering from STIs (95% CI: 1.89–14.81) than the group of MSW.

The evaluation of the variables that are associated with STIs in the multivariate model in MSM participants showed that for participants who reported more than 5 partners the OR was 10.24 (CI95%: 1.42–23.52) compared to those who had less than 3 sexual partners in 5 years. Sexual intercourse under the alcohol influence showed OR 2.41 (95% CI: 1.11–3.96). Forgetting to use a condom was 3.16 times more likely to contract an STI, including HIV (95% CI: 1.73–7.48). Participants who have sex with a casual

partner have a 1.4-fold increased risk of contracting an STI (95% CI: 1.01–2.16). The variables that did not show a significant relationship with the risk of contracting an STI in the multivariate model were age, going to nightclubs, and having sex with sex workers (Table 2).

**Tab. 2** Analysis of the sexual behaviors associated with the risk of sexually transmitted infection in men who have sex with men.

| Variable                                                | Crude model |            | Fitted model |            |
|---------------------------------------------------------|-------------|------------|--------------|------------|
|                                                         | OR crude    | IC 95%     | OR fitted    | IC 95%     |
| <b>Age years*</b>                                       |             |            |              |            |
| 15 a 24                                                 | 1.47        | 0.69–3.12  |              |            |
| 25 a 39                                                 | 3.03        | 1.37–6.65  | 3.37         | 0.88–12.84 |
| <b>Number of couples in the last 5 years (terciles)</b> |             |            |              |            |
| 3–5                                                     | 3.65        | 1.68–7.94  | 2.45         | 0.62–9.66  |
| > 5                                                     | 17.2        | 5.61–52.79 | 10.24        | 1.42–23.52 |
| Intercourse under the influence of alcohol              | 14.64       | 5.21–41.11 | 2.41         | 1.11–3.96  |
| Forget to use condom                                    | 6.94        | 2.77–17.36 | 3.16         | 1.73–7.48  |
| Go to the nightclub                                     | 3.38        | 1.73–6.55  | 1.19         | 0.336–4.21 |
| Eventual sexual partner                                 | 1.7         | 1.14–3.19  | 1.4          | 1.01–2.16  |
| Go to a sex worker                                      | 1.3         | 0.26–5.45  |              |            |

\* Compared to over 39 years; \*\*Compared to vaginal. Adjusted for age. OR, odds ratio; 95% CI, 95% confidence interval. MSM: Men who have sex with men; MSW: Men who have sex only with women.

## DISCUSSION

In this retrospective study, the sexual behavior of MSM participants during the monkeypox (MPOX) period 2022 in Huancayo-Peru was updated, since intimate physical contact during sexual activities is highly involved in the transmission of MPOX infection (9, 10). In addition, community transmission of MPOX is emerging disproportionately among men who have sex with men and is consistent with data reported by some studies (11, 12).

The purpose of this study was to examine the sexual behavior of MSM participants, identify the risk for STIs, and thus contribute to the development of disease control programs during the human monkeypox period. The average age of the MSM participants was 31 years, this age is like those affected by MPOX in MSM (13). Young population is the most affected by the activities of their age and their higher-risk sexual behavior.

HIV and other STIs were more frequent in MSM. In the context of MPOX, the studies reported that most patients with MPOX also have HIV or were found with pre-exposure prophylaxis (14), and other STIs such as herpes (15). The number of HIV cases were high in patients diagnosed with MPOX has raised the alarm worldwide, this leads the Centers for Disease Control and Prevention to publish recommendations for the prevention and treatment of MPOX in patients with HIV infection (16).

The high number of STIs diagnosed in the participants was surprising, this association is also frequent in other studies where more than two-thirds of MSM patients had been diagnosed with STIs in the last six months and almost half of them in the last month, in the MPOX period, this coincidence has also been observed in cohort studies that found high rates of STIs among MSM with MPOX infections (9, 17), so the suggestion to perform HIV and STI screening in patients recently diagnosed with MPOX or vice versa (16).

Participants who have more than 5 sexual partners are 10.24 times more likely to acquire an STI compared to those who have less than 3 partners. It is known from other studies that young men prevalence is to have multiple sexual partners (18), especially MSM who have an average of three partners in 6 months (19), like what was found in this study of four couples per year.

Alcohol consumption before sexual intercourse is twice as likely to acquire an STI and makes MSM participants make impulsively and unconsciously decisions, leading a risk during drunken state of conscious. This variable has not yet been studied in patients with MPOX infection and STI risk. The results also showed that homosexual men are less likely to use condoms, which is like studies from the United States and China, which found that MSM is more likely to have sex without a condom compared to heterosexuals (20), this may be due to the widespread idea that condom use is only to prevent pregnancy.

Active sexuality is related to MPOX infection (21, 22); in this study, sexual intercourses with casual partners were more likely to acquire some STI, similar to that reported by another study (23). It seems that the group of MSM attends more frequent entertainment sites to meet couples. The sum of all these common conditions in MSM

people makes them the group most affected by MPOX (10, 24). Interestingly, based on what was found in this study, it seems that going to nightclubs and having sex with sex workers are not risk factors to acquire some type of STI this can be explained by the people who go to these centers generally use condoms.

Our study has some limitations. First limitation concerns the compilation of the data, there may be some data that has not been reported by the participants. Furthermore, no cases of MPOX were diagnosed in this study. Another challenge of the study has been pinpointing exact sexual behavior, as most participants are fearful of intimate information and do not always openly disclose their homosexual behavior. In addition, sexual intercourse under the influence effects of alcohol makes it difficult for the participants to report actual sexual behavior.

## CONCLUSION

Sexual behavior of men who have sex with men was characterized by a greater number of sexual partners, non-use of condoms, sexual relations under alcohol effects and with casual partners, which may explain the high prevalence of sexually transmitted infections in this human group evaluated during the human monkeypox virus outbreak. These results emphasize that urgent educational prevention actions are required in these group of people and demonstrate a link between the sexual behavior of MSM participants and the high frequency of STIs.

## CONTRIBUTORS

RM and MM designed the study, analyzed the data, and drafted the manuscript. SC and LZ contributed to the questionnaire design and collected the data. CN undertook the statistical analysis. All authors reviewed the final manuscript prior to submission. RM is the guarantor of this paper.

## FUNDING

This work did not receive external funding.

## COMPETING INTERESTS

None declared.

## ETHICS STATEMENTS

The participants signed the Informed Consent for their inclusion in the study, maintaining the confidentiality of the data.

## ACKNOWLEDGMENTS

To Dra. María Fernanda Sánchez Vidal for the final review of the manuscript.

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