Elsevier has created a Monkeypox Information Center in response to the declared public health emergency of international concern, with free information in English on the monkeypox virus. The Monkeypox Information Center is hosted on Elsevier Connect, the company's public news and information website.

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Dear Editor,

The world is facing an outbreak of monkeypox. Since early May 2022, more than 60,000 cases of monkeypox have been reported from countries where the disease is not endemic. Monkeypox is a zoonotic virus that belongs to the Poxviridae family and is closely related to the smallpox virus. The disease has historically been limited to parts of Central and West Africa, but it has been suggested that waning population immunity associated with the discontinuation of smallpox vaccination from the 1970s onwards has established the landscape for the resurgence of monkeypox in nonendemic countries, particularly among individuals under 50 years of age [1].

Recently, we read with interest the narrative review by Patauner et al. [2] in this prestigious journal describing the epidemiological, clinical, and therapeutic aspects of monkeypox in the current outbreak. The authors report that the disease clinical presentation appears to have changed, and that virus mutations appear to have increased infectivity and favoured human-to-human transmission, particularly among men who have sex with men (MSM) as a sexually transmitted infection (STI). Epidemiological studies have shown that most cases of the 2022 monkeypox outbreak began as whitish solid papules on the anogenital region and extremities, which may progress to a necrotic center over time. Patients may also have oral mucosal ulcers. Furthermore, systemic symptoms such as lymphadenopathy, fever, myalgia, asthenia, and headache have been frequently reported [3,4].

Because the current outbreak presentation of monkeypox and routes of transmission are novel, findings from a comprehensive systematic review can assist physicians and other health professionals in understanding the disease and making decisions based on the best available evidence. The narrative review by Patauner et al. [2] inspired us to conduct a quantitative evidence synthesis on clinical characteristics, potential transmission routes, and risk factors in monkeypox patients.

Searches were performed in the peer-reviewed literature (PubMed, Web of Science, and SCOPUS) from May 1 to August 21, 2022, without language restrictions. The search was updated on September 1 to include newly published articles. We included studies that provided epidemiological and clinical data on patients diagnosed with monkeypox in the current outbreak. We excluded single case reports, small case series (<10 cases), publications with potentially overlapping reports, and studies where data extraction was not possible. In the case of potentially overlapping data, we selected the study with the most complete information. Titles and abstracts were screened first, followed by reading the full text of potentially eligible studies. To identify additional studies for inclusion, the reference lists of all eligible studies and reviews were also reviewed. The following search terms were used: “monkeypox”, “monkey pox”, and “monkeypox virus”.

Data from publications were extracted by two authors and crossequenced for accuracy. Our variables of interest were: country; number of cases; sex distribution; age; presence of mucocutaneous lesions and location (hands/feet, arms/legs, trunk, face, genital, anal/perianal, oropharynx/oral mucosa/lips); systemic symptoms (lymphadenopathy [inguinal, cervical, and axillary], fever, asthenia, headache, myalgia, sore throat or odynophagia); HIV infection and other concurrent STIs (gonorrhea, syphilis, and herpes simplex virus infection); occurrence of monkeypox among MSM; known contact with a confirmed monkeypox case or with people experiencing similar symptoms; travel abroad to endemic and non-endemic regions for monkeypox; prior vaccination against smallpox; hospital admission for clinical reasons; and deaths. The proportion of monkeypox cases according to the variables of interest was calculated using the variance-stabilizing Freeman-Tukey double-arcsine transformation with an inverse-variance random-effects model. Analyses were conducted in RStudio (version 0.98.1083).

After screening 1130 titles and abstracts, 35 full-text articles were assessed for eligibility and 21 studies were excluded, nine of which were due to potentially overlapping data. Fourteen studies were included, and data from 3097 patients were analysed (supplementary data). The median age in most studies was between 30 and 40 years, and the prevalence of monkeypox among men and MSM was 99.9% (95% CI 99.4 – 100.0) and 98.7% (95% CI 96.5 – 99.9), respectively. The prevalence of HIV infection was 37.9% (95% CI 32.7 – 43.1) among 1646 individuals with monkeypox and HIV status data available. Furthermore, the prevalence of other concurrent STIs, such as gonorrhea, syphilis, and herpes simplex virus infection, was 22.1% (95% CI 15.5 – 29.4). A recent history of travel abroad was reported by approximately ¼ of the patients (27.3%; 95% CI 16.8 – 39.2), but only two had visited monkeypox-endemic areas (West Africa). A small frequency of individuals reported having known contact with a confirmed monkeypox case or people experiencing similar symptoms (16.7%; 95% CI 5.8 – 31.4).

Fever (63.5%; 95% CI 59.4 – 67.5), inguinal lymphadenopathy (55.4%; 95% CI 36.7 – 73.5), and asthenia (47.4%; 95% CI 34.5 – 60.6) were the most common systemic symptoms. Mucocutaneous lesions were found in approximately 99% of individuals (98.8%; 95% CI 93.6 – 100.0), with a higher prevalence in the genital (56.2%; 95% CI 48.6 – 63.7) and anal/perianal (45.4%; 95% CI 37.0 – 53.8) areas. Other regions had a prevalence of lesions ranging from 16.5% (oropharynx/oral cavity/lips) to 44.7% (arms/legs). The hospitalization rate in patients with monkeypox was 7.2% (95% CI 3.9 – 11.2) and no deaths were reported. One hundred and sixteen of the 839 individuals with available vaccination data described prior smallpox vaccination (12.3%; 95% CI 9.3 – 15.5) (Table 1).

To the best of our knowledge, this is the first quantitative evidence synthesis on clinical characteristics, potential transmission routes, and risk factors of the multi-country monkeypox outbreak in 2022. Based on...
The higher prevalence of lesions in the anogenital region and oral mucosa among MSM suggests that the majority of lesions may initially appear at the inoculation site due to close skin-to-skin contact during unprotected sexual intercourse. Alternatively, the virus could spread hematogenously to regional lymph nodes or to distant sites. Although monkeypox is not considered a STI [8], recent evidence has found monkeypox virus DNA in the seminal fluid of 60% of individuals with the disease [9], suggesting the possibility of sexual transmission. In our study, we also found that two out of every five individuals with monkeypox in the current outbreak were living with HIV, and that the prevalence of concurrent STIs, such as syphilis, gonorrhea, and herpes simplex virus infection, was 22%. Despite the high prevalence of people living with HIV, most individuals had undetectable HIV-1 viral loads, and the role of immunosuppression as a risk factor for monkeypox could not be determined.

In addition, even among individuals living with HIV or with other STIs, the rate of complications and hospitalization associated with monkeypox appears to be low. However, understanding the current epidemiological scenario and directing efforts to implement educational and preventive public policies aimed at specific risk groups based on the best available evidence is critical. Discrimination and homo-bi-transphobia can lead to stigma and increase health disparities in the LGBTQ+ community [10]. Because the majority of cases in the 2022 monkeypox outbreak appear to be associated with high-risk MSM sexual behavior, and these individuals have a high prevalence of HIV infection and other STIs, STI screening and contact tracing of sexual partners should be included in clinical guidelines for suspected monkeypox cases. Surveillance is needed to monitor the potential spread of the virus to other social networks and the general population.

Authors contributions

All authors contributed equally to this manuscript.

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This study did not receive financial source.

Declaration of Competing Interest

The authors declare they have no conflicts of interest.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.ejim.2022.09.013.

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