



Perspective

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Monkeypox: A looming concern for children?

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Several countries around the world have followed the growing number of monkeypox (MPX) cases with concern, as they are still very sensitive to fears of a new tragic pandemic, as was the case with COVID-19. This alarm has been prolonged since May 2022[1,2], when the current outbreaks of the disease were observed in several countries outside the area normally associated with the circulation of the causative virus, monkeypox virus (MPXV).

MPXV has been known to the scientific community since 1958[3], and infections in humans since the 1970s[1]. The virus has double-stranded DNA as its genetic material and is transmitted *via* large respiratory droplets that travel some distance in the air, in addition to direct contact with skin lesions[1]. There is no confirmation of sexual transmission although recent data show a higher frequency among young men who have sex with men[2]. Could this high association with sexual intercourse to be a sign of abuse in infected children? Current data are still very scarce[4] but they need to be followed up to clarify this situation.

Clinical manifestations are very similar to traditional human smallpox, an infection transmitted by variola virus (smallpox)[1]. However, in MPX, lymphadenopathies are observed in addition to fever, chills, muscle pain, back pain, general malaise, and headache. The incubation period ranges from 5 to 21 days, and infection is usually self-limiting[5,6].

Outbreaks of the disease are common in African countries, particularly in the Democratic Republic of Congo[6,7]. However, before the World Health Organization (WHO) enacted the current outbreak, cases had already occurred in at least 10 countries in Africa and 4 countries on other continents[6]. In this context, Sklenovska *et al.*[7] noted back in 2018 that MPX is not a rare disease and that needs to be better studied, a finding supported by a growing number of cases. Despite the warning of these and other authors, however, there has been little progress in researching and disseminating this

disease, and in standardizing guidelines or treatment protocols[1].

Since the eradication of smallpox, MPX has been the main infection caused by viruses of this genus. Persons born before 1970, the year smallpox was eradicated, appear to be less affected, suggesting that the old vaccine provides cross-protection against infection, estimated to be as high as 85%[8]. However, the question arises about groups born after this date. Are children a risk group for this infection? Epidemiologic data already indicate that MPX has an overall mortality rate of 8.7%[6]. It is known that this rate can vary depending on the strain with which the person is infected[1] and the immunological status of the patient, with concurrent infection with HIV being an indicator of poor prognosis and more severe disease[5]. However, one fact that deserves attention is that the majority (between 80%-96%) of MPX cases were reported in unvaccinated individuals, a fact that raises many concerns. In addition, recently, the first cases of deaths caused by MPX were reported outside of Africa, raising an even greater concern among public health authorities and the general population[9].

The concern is even greater in children because of differences in susceptibility to the virus. Sklenovska *et al.*[7], who analyzed data from the period between 1970 and 1990, have already highlighted that most cases reported during this period (86%) were observed in children younger than 10 years. Furthermore, all deaths caused by

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the infection during this period occurred in this group, and although this number has decreased over the years to 37.5% of deaths[6], more recent data show that MPX mortality rates remain highest in children[10].

Using statistical projections, Nguyen *et al.*[11] estimated that only 10.1% of the world's population was vaccinated against smallpox in 2016, which would correspond to an overall immunity of only 2.6%. Data updated in 2018 show that vaccination coverage has dropped to 9.3%, which equates to an estimated immunity of 2.2%. These data are valuable and support our hypothesis of ever-increasing risk for children as they are not only unvaccinated, but also interact with populations that have ever-decreasing immunity. The data presented also support the hypothesis that the outbreak in question may be due in part to the disruption of vaccination protocols as they have been completely discontinued and the age group affected has grown larger.

So, it would be recommended to optimize and promote research for specific treatments. In this context, the antiviral tecovirimat seems to be an interesting alternative[10]. Finally, it would be essential to consider the possibility of resuming the vaccination program, at least in certain risk groups, such as travelers, immunocompromised individuals, and children. The vaccine developed against smallpox caused by vaccinia virus has about 85% protection against MPX[8], which would provide greater safety for these groups.

In conclusion, we reiterate that MPX is a disease of growing concern worldwide due to epidemiological, genetic, and immunological changes. We suggest that more research to be carried out to increase knowledge of rates of incidence and mortality in children, carrying out a careful anamnesis to rule out cases of abuse. Finally, we reiterate the need to determine the effectiveness of existing drugs and assess the possibility of reinstating vaccination protocols, especially for children and other vulnerable populations.

Conflict of interest statement

The authors declare no conflicts of interest.

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Authors' contributions

C.B.S.O, J.M.A.A, and J.I.N.O contributed equally to the design and writing of this work.

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