Rio Olympic Games: what are the medical journals saying on the eve of the event?

Half a million tourists and over ten thousand athletes are expected in Rio de Janeiro for the Summer Olympic Games. This is the first time that the event will be held in South America and the press has had a lot to say about it. Amidst controversies including health concerns, doubts about the readiness of infrastructure, political turmoil and an economic crisis, Rio will really be a *sui generis* setting for the Olympics.

A little more than a week before the official opening, we conducted a quick literature search to map what medical journals are saying about this event. Using the key words (Olympics OR Olympic games OR Paralympic games) AND (Rio de Janeiro OR Rio OR Brazil) we found about 50 articles that addressed some aspect of the competition.¹⁻⁵⁵

Papers analyzed the signs of progress in physical activity report and monitoring by several countries since the London Olympics ¹⁰, the possibility that scheduling night competitions in the games might hinder the athletes’ performances ¹¹, and how genetic variations might influence the result of elite sprint runners. ¹⁴

The levels of air pollution in Rio de Janeiro’s slums and its impact on athletes health and performance ²⁸,²⁹, as well as the poor quality of physical activity resources in those areas ³² and the appalling lack of sewage treatment contaminating the waters of Guanabara Bay ⁴⁶,⁴⁹ have all be closely examined.

Not surprisingly though, roughly half of those articles focused on the zika virus epidemic
and other arboviroses, their likely consequences and how athletes, visitors and the population in general should protect themselves.\textsuperscript{1-8,12,13,16,18,20-27,30,31,36,38,39}

As early as in 2014, there were already publications overviewing the health risks involved in travelling to Brazil.\textsuperscript{50,51,53,54} Gaines et al. searched the peer-reviewed and gray literature to provide travelers coming to the Soccer World Cup of 2014 and later to the Olympic and Paralympic Games with a list of actions to be taken ahead of the travel.\textsuperscript{54} The article described the most common diseases in Brazil (including dengue), which vaccines were available and which precautions should be taken in order to avoid illnesses.

The recent outbreak of zika in Brazil brought ample attention to this and other arboviroses. The confirmation that zika virus was circulating in the Northeast of Brazil happened in March 2015, after the report of several cases of a febrile exanthema tic disease which did not fill the parameters for either dengue or chikungunya fever.\textsuperscript{56}

Detailed data on the incidence of zika in every State and Region can be found for 2016, however official numbers regarding the impact of the disease in 2015 are still lacking, since the mandatory report was only determined last February. The latest epidemiologic bulletin emitted by the governmental organ states that between January 3\textsuperscript{rd} and June 11\textsuperscript{th} there were 165,932 likely cases of zika fever in Brazil, of which 66,180 had been confirmed by tests.\textsuperscript{9}

Recently, Burattini et al. used a mathematical formula to calculate the risk of acquiring the zika virus during the periods of Carnival and the Olympics.\textsuperscript{39} They used the 27,146 cases of the disease that were reported in 2015 as basis for their calculation. Results showed that the risk of acquiring zika would be 3.6/100,000 during Carnival (which is the hottest season and usually the peak of transmission for such diseases) and 1.8/1,000, 000 during the Olympics (a much drier and cooler season, often the nadir of transmission).

However, if the total number of zika infections in Brazil in 2015 was really 1.5 million cases (anecdotal information, as yet unconfirmed), then the respective risks would 1.3/1,000 and 3.2/100,000.

Another such mathematical calculation was performed to evaluate the risk of contracting dengue fever during the Games.\textsuperscript{2} This stochastic model took into consideration all historic data on the disease from 2000 to 2015. The calculations predict that in the worst-case scenario (based on the worst month of August, registered in 2007) incidences of 5.75 symptomatic and 51.5 asymptomatic cases per 100,000 individuals will be expected. That would result in 23 and 206 cases respectively.

Most authors did not support the postponement of the Games, particularly because delaying the event would place it in the middle of Summer, the hottest and most humid season when
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Mosquito populations increase all over the country. An extensive review of data regarding mass gatherings around the world (sports-related or religious) summarized the lessons learned and the implications for the Olympics in Brazil. The virus is present in over 60 countries and the risk of infection is real with or without the Olympics. The authors reinforce that any potential risks caused by mass gatherings can be lessened when they are previously recognized and planned for, and emphasize that, other events already occurred in the country without significant international spread.

About dengue

Dengue is an infection caused by 4 distinct viral serotypes, which are transmitted by the female mosquito of the genus Aedes. The disease was reintroduced in Brazil during the early 1980s and became a widespread problem by the mid-1990s. Nowadays, the country has the highest number of dengue infections worldwide, with more than 7 million reported cases. Up to 6% of travellers that visit Brazil and report febrile sickness on return are affected by it.

Dengue has a usual pattern of outbreaks during the year, with most of the cases concentrated during the hot and humid months of summer, when the proliferation of mosquitoes and their vectorial capacity are higher.

Symptoms include: mild, nonspecific febrile syndrome with headache and myalgia. About 5% of patients may present hemorrhagic dengue a severe and life-threatening condition. As a new dengue vaccine is being introduced and monitored in prevalent countries, general recommendation for infected patients are supportive treatment with rest and fluid ingestion and avoidance of non-steroidal anti-inflammatories and aspirin. Preventive measures to avoid the infection are the same described for zika below.

About zika

Zika fever is another disease cause by an arbovirus (flavivirus) transmitted mainly by Aedes mosquitoes bites (Aedes aegypit and Aedes albopictus), but also via sexual intercourse, perinatal or in utero to the newborn and likely by blood transfusion. The virus was first identified in 1947 on rhesus monkeys on the Zika forest in Uganda. From the first case in humans, in 1952 until the present day, outbreaks of zika occurred in 2007 in Micronesia, 2010 in Cambodia and 2013-2014 in French Polynesia. The latter affected 11% of the population (28,000 infected) and was marked an excessive number of Guillain-Barré syndrome cases. The virus might have been brought to Brazil during the 2014 Soccer World Cup or later that same year during Va’a World Sprint Championship canoe race in which teams from the Pacific Island competed.

One in 5 infected people will develop symptoms after 2 to 14 days of incubation. The disease often courses with a pruritic, descending and maculopapular rash, arthralgias, conjunctival injection, fatigue, malaise, retro-orbital pain,
paresthesia, headache, myalgia, and lymphadenopathy. Most cases are mild and can last up to 7 days. 24,37

There is an increased incidence of Guillain-Barré Syndrome among zika patients, although most patients fully recover. This neurological condition presents ascending motor weakness and paralysis (sometimes requiring ventilatory support) lasting for days or weeks. 37 Another potential complication of zika, is the development of microcephaly and other neurological abnormality in newborns, when the infection occurs during pregnancy.

There is not a specific therapy. Since zika is usually self-limited with mild symptoms, rest, hydration and acetaminophen are recommended. Nonsteroidal anti-inflammatories and aspirin should be avoided because they increase the risk of hemorrhage in dengue cases (differential diagnosis).

Prevention of zika and dengue

The key point is to avoid mosquito bites. 8 So, the CDC recommends the following actions to athletes, visitor and the general population:

• **Personal protection:** wear long-sleeved shirts, long pants, use insect repellents and treat clothing and gear with permethrin. 23,37

• **Safe sex:** since the zika virus can be spread through semen during all stages of the disease, the use of condoms should be considered for male athletes who have been diagnosed or had symptoms (for at least 6 months), those who traveled to an endemic area but did not have symptoms (at least 8 weeks after returning) and those who live in such an area. 23,37

• **Environmental precautions:** stay in places with air conditioning or that use window and door screens to keep mosquitoes outside, sleep under a mosquito bed net, avoid places with stagnant water (tires, flower pots, containers, etc.) since these are breeding grounds for larvae and mosquitoes. 23,37

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